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Because of the length of these articles our OPEN FORUM section has suffered from being pushed aside again in this issue. But it will be back in the CN80 January issue as usual.

HAVE A MERRY TRS-MAS

EDITORIAL COMMENTS

This issue closes three years of publishing CN80, and opens the way for all the great things that we have planned for 1991 and beyond for years to come. New software is being developed for the TRS-80's even today. Who would have thought that three years after Tandy and all the major publications decided to dump all of us TRS-80 users, that there would be new software being written for us. For those of us who have stuck with these machines the cost of expanding our software library couldn't be better.

Just read Peter Ray's article on the use of the Z-280 and you will get an idea of how bright the future can be for these computers. We already have the super memory expansion available. Interfacing with Laser printers, soft font download capability, and soon we will have new programs such as dos/directory management programs and upgraded music play/write programs for the model 4s and if demand is there for the Model IIIs.

Some of the Model III people have written in saying that we have abandoned coverage of their machines. We have no intention of doing so, but right now the new stuff being developed - and more importantly *written about* seems to have been centered around the Model 4. But again we must point out that everything written about TRSDOS 1.3, NewDos 86, LDOS 5.3 and other DOSs are applicable to the Model 3 user, as well as the Model 4 user (in the 3 Mode). We ask for the Model 3 owners to contribute their experience in the way of articles, programs etc. along with their wish list letters. It all helps guide us in what to cover in CN80.

TRX-280
The Next Generation of TRS-80
by Peter Ray (Anitek)

How would you like it if your TRS-80 had the expandability of an IBM XT, yet had more built-in features, ran faster, had more on-board memory, and all without having to make a single modification to your TRS-80 mother board? Sound fantastic? It is actually possible, and may soon even become a reality, with the proposed "Next Generation" replacement mother board, called the "TRX-280". This marvel of modern technology is already in the earlier stages of development as this article is being written.

Anitek Software Products has already begun developing a totally new replacement mother board for the TRS-80 that would empower your Model 4 and 4P to new levels of performance that were only before dreamed about by TRS-80 enthusiasts, like yourself. Our design criteria for the TRX-280 were simple. First, design a mother board the same size and dimensions of the TRS-80 mother board that would already have built into it most, if not all, the features that could, up until now, only be added to a TRS-80 by purchasing and installing a full compliment of the currently available modification kits. Second, design into the TRX-280 mother board many features that are not currently available to TRS-80 users even as modification kits - features that the original TRS-80 designers should have designed into it in the first place, but didn't - features like on-screen underlining, bold and italic which is a most needed feature in both the word processing and data processing environments. And third, even with all this new power, the TRX-280 had to be designed to continue to be totally TRS-80 compatible so that any programs that now run on a stock TRS-80 Model 4 or 3 will still run on the new TRX-280 mother board (except programs that use the cassette port).

The following is a list of the proposed features that Anitek believes can be designed into the TRX-280 replacement mother board, the size of the TRS-80 mother board, using the state-of-the-art technology that is available today.

1. A Z-280 microprocessor running at 10 MHz (which is equivalent to the speed of a Z-80 running at about 15 MHz).
2. On-board RAM expandable to 4 megabytes (possibly even 16 Meg).
3. Built-in bit-mapped graphics.
4. Built-in clock/calender.
5. Built-in hard drive host adapter.
6. On-screen text underlining.
7. On-screen text bolding.
8. On-screen italics.
9. On-screen expanded text.
10. Ability to display IBM characters, TRS-80 characters, block graphics, bit-mapped graphics, inverse video, bold text, underlined text, italics, expanded characters and normal size characters all on the screen at the same time.
11. A floppy disk controller that is capable of handling 180K, 360K, 720K, 1.2 Meg, and 1.4 Meg floppy drives.
12. Ability to boot directly from a hard drive without the need to first insert a floppy.
13. Ability to boot Model 3 DOSs directly on a 4P without MODELA/III.
14. One, or possibly even two, expansion slots, compatible with the IBM PC 8-bit expansion card architecture.

The on-board expansion slots would make it possible for the user to further expand his system with inexpensive half-size expansion cards currently available for the IBM PC. Some examples might include: hand scanners, modem cards, color monitor cards, mouse cards, and hard drive interface cards, just to name a few.

Sound too good to be true? Admittedly, it sounds fantastic, but it is absolutely possible! Much of the conceptual design work has already been done. In fact, about one year from today it could even be possible for you to purchase one of these new TRX-280 mother boards and have all of these features in your TRS-80.

Parenthetically let me state that even though we are very sure that we could design and build a multi-featured mother board the size and dimensions of the TRS-80 mother board, and even though we are very sure we could design a mother board with all the above features, it is still a little early yet to know for sure whether or not we can do both - i.e. make the mother board the size of TRS-80 mother board and at the same time give it every one of the new features mentioned above. The physical size of the mother board may impose a limit on the number of new features that we could design into it. However the TRX-280, if produced, will be the size of the TRS-80 mother board (that is a must) and it will have most, if not all, the above-mentioned features - all of the most important features for sure.

Yet, before Anitek Software Products can move from the safe and cozy arena of conceptual design on the TRX-280 project into the financially risky arena of actually developing and manufacturing such an awesome product, it will be necessary to first do a some careful market analysis to determine just how successful a product like the TRX-280 mother board will be in the TRS-80 marketplace. We already know that a mother board could be designed that could have most, if not all, of the features mentioned above, plus possibly even some additional features that were not mentioned. What we don't know is, are there enough people like yourselves who own TRS-80s that would be interested in buying the new TRX-280 mother board to justify to us the huge investment of time and money that it would take to develop and produce it. This is where you can help us out.

We would like to see what kind of interest a proposed product of this type will generate in the TRS-80 marketplace. If the TRX-280 is to become a reality, we will need to have this information early on, before we begin full-scale development. If the TRX-280 mother board were available today, would you buy it for your computer? Why or why not? If it were available a year from now (which is about the earliest it could be ready) would you buy it? Do the features sound interesting to you? Do you feel that some of the proposed features are of more value to you than other features? If so, which features do you rate the highest and which the lowest? Does the fact that you could have virtually every modification known for the TRS-80 built right into the mother board as standard equipment interest you? Would having a TRS-80 that you could plug off-the-self IBM compatible expansion card into interest you? Does a TRS-80 that could out perform an IBM XT interest you? What other features have you thought would be nice to have built into a TRS-80 that are not mentioned in the above list?

We want your responses. If you have questions or comments regarding the TRX-280 mother board project, we want to hear from you. But we need to have you write your letter to CN 80. The editors have very graciously and enthusiastically agreed let us use this publication as an open forum for sharing ideas and questions regarding the TRX-280. By you sharing your thoughts with the magazine, you will also be giving the other readers the opportunity to see what you are thinking about the "Next Generation", TRX-280 concept. And at the same time, you will have the advantage of seeing what others are saying about this fantastic idea, as well. If any of the letters submitted to CN 80 need our attention for commenting on, the editors will make sure Anitek sees a copy of the letter ahead of time so that our comments can be published along with your letter.

If you are feeling like you can't live another day without one of these TRX-280 mother boards for your computer, or if you just think the concept sounds interesting, please let me strongly encourage you to, in the next day or two, write it down on a piece of paper and send it in to CN 80. And when you read the comments from other readers in next month's issue, if you have anything other ideas you would like to voice, write those down, too, and send them in. Your positive interest and enthusiasm shared in this publication is what it may take to generate in the other readers a strong interest as well. Excitement breeds excitement. Enthusiasm breeds enthusiasm. This way we can get the fires of interest in this "Next Generation" of TRS-80s burning faster and hotter. No comment or question is too small. If you have something you wish to voice about the TRX-280 before we begin development, please send it CN 80. It's going to take all of us to turn the TRX-280 from merely a great possibility into a great reality.

In anticipation of some of the questions that you might already have, I have answered what I feel may be the more obvious questions. Keep in mind though that no one can predict the future with absolute certainty. The answers given below are based on possibilities and expectations of future events.

Q. How much will the new TRX-280 mother board cost?
A. Probably somewhere between $700 to $900 depending on the number of boards that we feel will be purchased. We will have a better idea after we have had the chance to measure the market interest and to tally the advanced orders before we go into the final design stages of production. The price could even be considerably less if a good number of people commit ahead of time to the purchase of the TRX-280 board by placing advanced orders. We are also looking into the possibility of offering an extra discount as an incentive to those who are able to place advanced orders, probably in the form of granting a discount equal to 1/2 the purchaser's advanced down payment. This could bring the price down to as little as $500 - $600 for those who are able to put that much down on an advanced order. Under this proposed plan a customer making an advanced payment of 2/3 of the cost of a TRX-280 mother board would get the last 1/3 free. This would be a fantastic way to substantially lower the cost of owning a TRX-280 mother board. But even at the expected normal price of $700 to $900, this is really still quite a bargain when you consider that it would cost over twice this amount to buy even half these features as individual modification kits, not to mention the days or weeks it would take you to install each one. By the way, if advanced orders are received with advanced payment but the number of which is not large even to justify the final development and manufacturing of the TRX-280, then the advanced payments would be returned.

Q. Will my other TRS-80 programs still work on the new TRX-280 mother board?
A. Yes. This is our number one most important design objective. We will do everything in our power to ensure that all TRS-80 Model 3/4 software (except programs that access the cassette port) will work as well or better on the new replacement mother board as they do on a stock TRS-80. It is a little early yet to know whether or not any DOS device drivers might require patches to work at the faster CPU speed. If there is any clever way to design around this in hardware, we will.

Q. Will the bit-mapped graphic circuitry of the TRX-280 be compatible with the Grafyx Solution board.
A. Yes. It is our number two most important design objective to make sure that all your Grafyx Solution programs work as well on the TRX-280 as they do on the TRS-80 mother board.

Q. How soon will the new TRX-280 mother board be ready to buy?
A. Once we begin full-scale development we expect it will only take about 12 months. The sooner we know that the TRX-280 is a product that that TRS-80 marketplace will buy, the sooner we will be able to start the full-scale development phase, and the sooner it will be available for you to purchase.

Q. Will I have to put a heaver power supply in my computer?
A. At this point we feel that it won't be necessary to change the power supply as long as it is in good condition and is not one of the earlier supplies that were small and under powered. Our objective is to design the board in such a way that it will work with the same power supply that you now have.

Q. Can I trade in my old mother board and get a credit toward the purchase of a TRX-280 mother board?
A. We may offer some sort of credit if you wish to trade in your old mother board, but it may only be for about $25 to $50. The fact is that the technology will be so much more advanced on the new mother board that there will be only a few components on the old TRS-80 mother board that will be usable on the new TRX-280 boards.

Q. Can I put one of the new TRX-280 mother boards in my Model 3.
A. Yes. Since the Model 3 has basically the same case and mother board housing as the non-gate-array Model 4, as far as we can tell you would be able to put a TRX-280 mother board in a Model 3.

Q. Will technical information be published to explain how to take advantage of all the new features?

A. Yes. We want you to get the most out of the product as possible, so we will publish what all the port addresses are and what they do, and the memory maps and all hardware technical info we can think of to benefit those who want that type of information.

Q. Will the TRX-280 mother board be available for the Model 4 first, or for the 4P?
A. That all depends on which one of the two versions we get the most advanced orders for before we begin final development.

Q. Will the new mother board be able to run MS-DOS programs?
A. No. We don't feel that there is any need for us (or anyone else) to come up with another IBM clone. If we thought you wanted a computer that could run MS-DOS programs we would have thought that you would have bought an MS-DOS computer. The TRX-280 mother board is for people who love their TRS-80s and don't care to switch over to the MS-DOS world. Yet, at the same time, they see what the MS-DOS machines can do and they long for a way that they could have the same power and performance on there TRS-80.

If you have any other questions, and I am sure you do, please send them into CN 80 as soon as possible so they can get into the next issue.

In closing, let me stress that the outcome of the TRX-280 replacement mother board project is now in the hands of you, the readers. I know you have a great attachment to your TRS-80, or you wouldn't be reading this magazine. We at Anitek also share in this love for what was and is still one of the greatest little computers ever made. But our strong appreciation for the TRS-80 only makes us more keenly aware of its several designed-in limitations and makes us long for the TRS-80 that could be, the TRS-80 that is now possible with the advent of the TRX-280 replacement mother board. But the bottom line is this, we know that we can design and build the TRX-280, but whether this product ever sees the light of day is something that you now have the opportunity to decide. Are you ready to usher-in the "Next Generation" of power, speed, features, capabilities, and expandability - or are you satisfied with the current generation of TRS-80 just the way it is? Cast your vote of support for the TRX-280 by writing a letter to this publication. And if you are already sold on the idea and would like to place an advanced order to lock-in a lower price for yourself, let us know that too, so we can send you the details on how to place an advanced order. But again, please do so through CN 80 so that all readers can see the degree of interest this new product is generating. I am eager to hear your votes, answer your questions, respond to your comments, and discuss more of the aspects of the "Next Generation" with you again next month.
-Peter Ray (Anitek)

MOUSE ON YOUR MODEL 4
(Without an Interface) Part II
by David Goben

I've received numerous complaints that I did not follow my first mouse article with the follow-up in the very next issue, or the one after that. Actually, I had only said that I would cover some things in my -next- article on the mouse, and did not promise to cover it immediately. Finally, I apologize for the technical depth of this article, but due to space constrains, I cannot expect to be able to use the entire issue of CN80 to explain the intricate working of a mouse in a more comprehensible format.

The idea of communicating with a serial mouse may have seemed complicated, because no one seemed to think it could be done. It was probably just one of those things where one simply assumes that such a task to be incredibly complex. Fortunately, Scott McBurney did not think so, and blazed the trail toward using a mouse on a TRS-80, thus sparking my own underlying interest. My contribution to this effort was to improve on the basic driver design, simplify the interfacing process, give it more sophisticated commands, and allow it to work on both a 2-button and a 3-button serial mouse. Recently I had the opportunity to modify Scott's MDRAW/BAS hires drawing program to use my new mouse driver, and the impressive results of using a mouse in the hires mode are astounding.

Contrary to popular belief, the process of interfacing with the serial mouse is actually quite simple. Problems only arise when you try to write one driver to support both 2- and 3-button mice, since the hardware interfacing could not be more different. But I wrote my driver to support both, and to provide identical results. Thus a program that would use my mouse driver would not have to concern itself with which kind of mouse, and simply follow the interface specifications laid down for the driver.

First of all, the mouse, when connected to the computer's 25-pin serial interface port (9 pins are actually all that are used), it is constantly sending information concerning its button and ball movement status. Because it is constantly sending information, it cannot wait for the user to access it before it sends more data. Therefore an internal program must be linked into the interrupt structure of the computer to constantly monitor the various mouse actions, so that an accurate report of a button or ball movement on the X or Y axis can be maintained. Otherwise the mouse would report useless information.

SYSTEM INTERFACING

The interface procedure cannot be done through normal channels. The first obvious interfacing choice is to link this control routine through the interrupt task slots, which LDOS and TRSDOS/LS-DOS 6 have 12 (0-11) available. Most tasking routines use the Real Time Clock task interrupt slots. However, because interrupt tasks are not executed during disk input/output, this method must be cast aside. By linking through the keyboard tasker, we may be able to perform the required function, but again, if the type ahead feature is turned off, then we again lose. Also, this avenue becomes unreliable even when type ahead is active, because keyboard interfacing is slowed down tremendously when the disks are accessed, thus also providing unreliable results. The final recourse is to take advantage of the little-documented IM1 (INTERRUPT MODE 1), which the Model III and 4 operate under. This causes a branch to INT 38H anytime a hardware interrupt is detected. As designed, the Model III and 4 permit only 8 interrupt latches (0-7), which are (fortunately for us) designed to work off of the RS-232 interface. These 8 individual latches are activated by setting the desired bit, zero through 7, of port E0H. Active latches are also detected by the computer by reading port E0H. For technical thoroughness, when reading from port E0H, a reset (off) bit indicates that the corresponding latch is active (kind of backwards, I guess).

What we are interested in is forcing an interrupt each time that the mouse is ready to send us some information. If we put on our hard hats and dig through several technical manuals, we will discover that to do this we need to connect ourselves to interrupt latch # 5. By activating this latch (bit 5 of port E0H), this will enable RS-232 receive data interrupts. As stated earlier, when one of these interrupts occur, control is transferred to interrupt vector 38H in the form of placing the address of the program instruction about to be executed onto the stack (so that a return code will then continue normal program execution) and going to the transfer address at address 38H.

TRSDOS/LS-DOS 6 store the vectors for the eight interrupt latches as 8 groups of 2 bytes (an address consists of 2 bytes) starting at memory address 3EH. The address for our routine will have to be placed in slot 5, or at address 48H. Also, we will have to look at the WRINT$ flag in the FLAG$ section (flag "W"), set bit 5, and send the new byte value out through port E0H, to enable the desired interrupt.

This sounds complicated, but it is not. As a machine language example, suppose that register HL contained the address for our interrupt latch routine. We could activate it using the following code sequence using DEA:

```
        DI                  ;turn off ints
        LD    (48H),HL      ;set new vector
        SVC   101           ;@FLAGS
        SET   5,(IY+22)     ;set latch 5
        LD    A,(IY+22)     ;get new image
        OUT   (0E0H),A      ;set to mask
        EI                  ;turn ints on
```

Of course, if your installation routine will later be able to remove itself, as my mouse driver does, it would be a good idea to save the original contents of latch 5's vector contents, as well as a copy of the original flag W value.

Model III users will find interrupt latch 5's transfer vector at 420AH. LDOS users will find latch 5's address at 447FH. As you can see, a Model III program must be able to detect where it is operating from. If I recall, TRSDOS 1.3 uses 420AH for latch 5. Since there is no W flag for the Model III, you must remember this, which is identical to the Model 4: Bit 0 is used for the 1500 baud rising edge, bit 1 is used for the 1500 baud falling edge, bit 2 is used for enabling and disabling the real time clock, and bit 4 is used to enable the external I/O bus interrupts. For all practical purposes, you need only to remember bit 2 (a value of 4), in addition to bit 5 (a value of 32). Thus, sending a value of 32 + 4, or 36, should be adequate to activate the interrupt latch and keep all things running smoothly.

THE MOUSE INTERFACE

Of course, all this is assuming we already have our routine written. But what does this "routine" consist of? This again can be tricky to describe, but is also quite simple.

We must read the mouse in three separate passes. First for reading the buttons, next for reading the X (left-right) vector, and finally to read the Y (up-down) vector. Basically what this means is that each time the interrupt latch is executed, we must perform a different task. This calls for maintaining a flag which would tell us which pass we are currently on. For example, on entry to our routine (registers AF, BC, DE, HL, IX, and IY are automatically saved previous to entry, so we can be "barbaric" and do whatever we want to the main registers without care), we should pick up our flag to check which state we are going to process. As my mouse driver is designed, a value of zero indicates we are checking for the buttons, 1 if for the X-vector, and 2 if for the Y vector. Once a certain task is completed, the flag is looped to the next task: Buttons to X-vector, X-vector to Y-vector, and Y-vector to Buttons.

CHECKING BUTTONS

The check for the buttons is the most important, since we must not process anything until we have detected the value which tells us that we are in fact reading the buttons. We do this by reading a byte from port EBH. This is the RS-232 data register; the stuff the mouse is sending us.

On a 2-button mouse, we check to see if bits 7 and 6 are both set. If they are not, then we are not reading the buttons, and so return to the caller without advancing the procedure flag. If it is, then bit 5 being set tells us that the Left button is pressed, and bit 4 being set indicates that the Right button is pressed. Obviously, if both are set, then both buttons are pressed. Bit zero indicates the X direction. If reset, then we are moving to the right (positive). If set, then we are moving to the left. Bit 3 indicates the Y direction. Reset indicates down (negative), and set indicates up (notice the contradiction between X and Y).

On a 3-button mouse, we check bits 7 through 3. If only bit 7 is set, we are getting the button status. Unlike the 2-button mouse, a 3-button mouse indicates a button press by have a bit reset instead of set. If bit 2 is reset, then the Left button is pressed. If bit 0 is reset, then the Right button is pressed. If bit 1 is reset, then the Middle button is pressed.

Once the button status is read, the procedure flag is updated to 1, so that the next time the latch is executed, we will be checking for the X-Axis value.

The next byte read will represent the number of "Mickies", or units, that the ball within the mouse has moved since it was last read. On a 2-button mouse, this variance is read as rightward if the button status byte (which we had to obviously save to do this) indicated that bit 0 was reset. On the 3-button mouse, we simply have to check bit 7 of the X-axis byte. If set, we are moving left. Reset indicates right. We then apply this value to a stored X value accumulator. If after applying the new value, it exceeds a limit, such as 4095, then the "top" is locked at 4095. If it goes below zero, then we lock it at zero. Once the X value is processed and stored, we set our flag to 2 so that the Y value will be read.

When the Y value is read, on a 2-button mouse we check bit 3 of the button status. If reset, we are moving rightward, in a positive direction. On a 3-button mouse, we again check bit 7 of the Y value. If set, we are moving down (negative -- again, notice the difference from that for the 2-button mouse). Once the Y value is applied to the stored Y value and saved, we reset the flag to zero and leave. Thus the cycle continues.

TRICKS AND TRAPS

Of course, following this procedure will give you the basic theory of the mouse operation, but it will not provide smooth movement. It took me quite some time, laced with a -lot- of trial and error, before I was finally able to glean smooth movement from the mouse.

I have found that smooth operation comes from fancy coding tricks. For example, I've enhanced the flagging procedure to contain 5 steps instead of 3. Step zero checks the buttons. Step 1 checks the X vector. Step 2 checks the Y vector. Step 3 checks the X vector again, but first checks to see if the button status is present. If so, then the button check, step zero is gone to. Step 4 checks the Y vector again, but first checks to see if the button status is present. Again, if so then step zero is gone to. Why do I do this? Because after long hours of hair pulling, I discovered that in most cases, we get a button byte, followed by an X byte, then a Y byte, then another X and Y byte. But once in a while we are fooled by the button status popping up amidst the second volley of X or Y values. Sure, we could go ahead and do the 3 step process, and simply wait for the button status to come after reading the first Y value, but the mouse motion will become wildly unsteady.

Another problem is that the "mickey" report is often irratic. In order to smooth it down, X and Y reports of zero and 255 are interpreted as no motion at all. Also, by anding a value of 3EH to each report, we can "tame" the value to a more manageable level. I've also found that dividing the result by 2 for Y values smooths the Y motion a lot.

Of course, you can get fancy like I did and perform sensitivity factoring, so that mouse motion can be sped up or down. This was done by taking the value after anding 3EH to it, and adding a value of 12 to it for the factor count plus 1.

My mouse driver also features scaling, so that the X and Y ranges of zero through 4095 can be scaled to relative ranges, such as 80 x 24 for the standard Model 4 text screen, to 160 x 72 for the lo-res graphics screen, or 640 x 240 for the hires graphics screen, not to mention any other scale you would wish to use.

READING THE MOUSE

The final step is reading this information. By picking up the stored button status, you can take advantage of it at the hardware level, and so test the button bits without interpretation for either type of mouse, or apply a translation to meld the results of either mouse to provide the caller with identical results. The X and Y values can be factored either manually by you, or by the driver, as mine does. If you look back to CN80 Volume 3 no. 8 (August 1990) to my first article, you will see how you can interface with my driver. It features the ability to set up for either a 2- or 3-button mouse, install itself into high memory, remove itself if desired, report its current status, allows you to change its status, assign factoring and even sensitivity, either from the DOS Level or by using SVC 120, the @MOUSE interface. This mouse driver is available from CN80 for only $5, and includes a couple of sample programs, along with the source code for the samples, fully commented. Of course you also get the MOUSE/CMD driver.

BASIC INTERFACING

If you would like to use the mouse interface from Model 4 BASIC, you will need the BASIC that came with LS-DOS 6.3.0 or 6.3.1. This is because we will be using the SVC interfacing function : USR11.

To begin with, in your program you must create an integer array to store or register values in. This can be accomplished with the command DIM SVC%(5). In element zero you store the SVC number. In our case this is always 120. Thus SVC%(0)=120 accomplishes this task. Element 1 contains the desired HL value, if needed. Element 2 holds any value for DE. Element 3 holds BC. Elements 4 and 5, for IX and IY, are not needed, but must be included in the DIM statement, or we will have program accidents. The only tricky part here is in the part of the registers **B** and **C**, because they are used separately. The value for B must be multiplied by 256. If a C value is required, it must be added to this. This also extends to AF, the Accumulator and Flag register, but this is only upon return to the caller. Lets do some examples.

As a first example, we should ensure that the @MOUSE interface is present. We can do this by trying to read the mouse status, thus:

```
SVC%(0)=120  'set SVC to 120
SVC%(3)=1*256'set B to 1
A=USR11(VARPTR(SVC%(0)))
A=SVC%(0)\256 'get A value
IF SVC%(0) AND 64 GOTO error
```

In the above example, the routine "error" will be gone to if the result of anding 64 to the value stored in SVC%(0) is non-zero. What we have just done is test the computer's internal Z/NZ (Zero/Non-Zero) flag. Non-Zero indicates an error. Of course, you should replace "error" with an appropriate line number which will handle the error, such as printing a message stating that the mouse driver is not present.

Enhancement of this example: Function 1 returns the current mouse status and the X/Y offsets. The BASIC program lines to accomplish this are:

```
SVC%(0)=120  'set SVC to 120
SVC%(3)=1*256'set B to 1
A=USR11(VARPTR(SVC%(0)))
A=SVC%(0)\256 'get A value
X=SVC%(1)     'get X value
Y=SVC%(2)     'get Y value
```

In this example, we have executed @MOUSE function 1. On return, variable A contains the button status, variable X holds the X offset, and variable Y contains the Y offset. To check buttons is easy.

If you AND variable A with 7 and the result is 7, then no buttons are pressed. If you and A with 0 and get zero, then the right button is set. If A anded with 2 is zero, then the middle button is pressed (or both buttons on a 2-button mouse). If A anded with 4 is zero, then the left button is pressed.

Now lets do a more involved example. Suppose we want to set up the screen for text mode 80 x 24, and place the mouse pointer in the center of the screen. We would do this by first setting HL (X) to 80, and DE (Y) to 24 using function 4. Since we also need to set C to the sensitivity factor, lets set it at 0, for normal motion.

```
'FIRST SET XSIZE/YSIZE
SVC%(0)=120 'set SVC number
SVC%(1)=80  'set XSIZE
SVC%(2)=24  'set YSIZE
SVC%(3)=4*256+0
A=USR11(VARPTR(SVC%(0)))
'NOW SET LOCATION
SVC%(0)=120 'set SVC number
SVC%(1)=80\2'set to middle of screen
SVC%(2)=24\2
SVC%(3)=2*256
A=USR11(VARPTR(SVC%(0)))
```

And there you have it.

By the way, in case you are wondering, you will have to control the "visibility" of the mouse pointer on the screen. Of course, you will want the mouse pointer to be non-destructive if you are just moving it around the screen. You can use USR11 to save the current character at the pointed position by using function 1 of the @VDCTL (15) SVC. Suppose we wanted to use rocket ship character (255) as the pointer? Also, we have the current character at the last X/Y position stored in variable C, and the old X and Y values stored in variables X and Y. We could update the non-destructive cursor by placing the old character back into its old position, and pointing to the new position, storing the character that was there, and place our mouse pointer there. This of course loops until a certain action, such as a button press, for example, causes another action. For that reason, let's save the button status to variable B.

```
'******
'Restore Old Char

'******
SVC%(0)=15
SVC%(1)=X*256+Y
SVC%(3)=2*256+C
A=USR11(VARPTR(SVC%(0)))
'******
'Get New Mouse Position
'******
SVC%(0)=120
SVC%(3)=1*256
A=USR11(VARPTR(SVC%(0)))
B=SVC%(0)\256
X=SVC%(1)
Y=SVC%(2)
'******
'Get Character There
'******
SVC%(0)=15
SVC%(1)=X*256+Y
A=USR11(VARPTR(SVC%(0)))
C=SVC%(0)\256
'******
'Put Mouse POINTER
'******
SVC%(0)=15
SVC%(1)=X*256+Y
SVC%(3)=2*256+255
A=USR11(VARPTR(SVC%(0)))
```

As always, this only looks tricky, but is actually quite simple.

CONCLUSION

You now have more than enough ammunition to take full advantage of the serial mouse, either by your own constructed from the information provided in this article, or the @MOUSE interface provided on the CN80 MOUSE Driver. If you have trouble interfacing with the @MOUSE driver, or are having technical problems in developing your own, drop me a line in care of CN80 and I will help you as best I can. Due to lack of interest on the Model III reader's part, I have not yet developed a Model III version. I will write it if this attitude changes.

Happy Mousing!

-David Goben

ANNOUNCING TWO NEW BOOKS BY CHRIS

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These two new books combined with Z-80 Tutor I and Z-80 Tutor X make a complete four volume set. A must for any Assembly Language user. (See ad section for details.)

ASSEMBLY LANGUAGE TUTOR Part 23

by Christopher Fara (Microdex Corporation)

Programmer's Toolbox

Many "chores" in programming are so common that we'd often wish for more instructions like LDIR to do a job in "one shot". Unfortunately there aren't many like that, so we gradually accumulate our own mini-procedures to substitute for non-existent instructions. For example CP compares one byte at a time. Wouldn't it be nice to have an instruction to compare strings of any length? A substitute for such "eXtended CP" could be called XCP. On ENTRY

HL=> first string
DE=> second string
BC = length to compare (1 or more)

```
;-------------------------------------------------------
XCP:  LD      A,(DE)    ;2nd string
      CP      (HL)      ;match 1st?
      RET     NZ        ;no, quit
      LDI               ;next
      JP      PE,XCP    ;more?
      RET               ;all match
;-------------------------------------------------------
```

This is an interesting "creative" use of the LDI instruction. If there is a match then LDI automatically does three things for us: increments HL and DE to point to the next character, and decrements the counter BC. It also "loads" the byte from first string into the corresponding byte of second string. But this doesn't bother us. We just compared these bytes and they were identical, so the "load" won't change anything. The loop stops when the first mismatch is found, or after all characters are successfully matched. On return inspect Carry and Zero flags:

C and NZ: 2nd string is "smaller".
NC and NZ: 2nd string is "greater".
NC and Z: strings are "equal".

Note that the length to compare must not be zero. Otherwise on the first pass BC could be decremented to -1 (same bit pattern as 65535) and the loop might run wild past the length of strings. If there is a possibilty of "null" length, then before calling XCP check the length, for example:

```
;-----------------------------------------------------------
        LD      A,B     ;high byte
        OR      C       ;both zero?
        CALL    NZ,XCP  ;no, else...
;-----------------------------------------------------------
```

If the length turns out to be zero, then the call is skipped and program continues. Since OR always resets Carry and Z-flag is now set, the program gets the same flags as in an "equal" comparison, even though XCP was skipped. This is correct, because "null" strings are obviously equal.

Or take for example EX which handles 2 bytes at a time. How about exchanging any number of bytes in non-overlapping blocks of memory? Call this XEX (eXtended EXchange). On ENTRY

HL=> begin 1st block
DE=> begin 2nd block
BC = size to exchange (1 or more)

```
;-----------------------------------------------------------
XEX:    LD      A,(DE)  ;2nd block
        LDI             ;1st to 2nd
        DEC     HL      ;back off 1st
        LD      (HL),A  ;2nd to 1st
        INC     HL      ;adjust HL
        JP      PE,XEX
        RET
;-----------------------------------------------------------
```

A character from 2nd block is temporarily held in register A, the LDI instruction makes a copy from 1st block to 2nd, increments HL and DE, and decrements BC. Since now HL already points to a next byte, we must DECrement it before we put into 1st block the byte saved in A, and then INCrement again to continue the loop.

Another typical job is to fill a block of bytes in memory with some "filler" character, such as "blank" or "zero" or whatever. On ENTRY

DE=> start of fill area
BC = size to fill (1 or more)
A = filler character

```
;-----------------------------------------------------------
FILLS:  PUSH    DE      ;start
        POP     HL      ;HL=start
        LD      (HL),A  ;fill 1st
        INC     DE      ;point 2nd
        DEC     BC      ;count down
        LD      A,B
        OR      C       ;zero?
        RET     Z       ;done,else
        LDIR            ;propagate
        RET
;-----------------------------------------------------------
```

Insert filler in the first slot, increment DE to point to the next slot, and decrement the counter. Now test if any more remain and return if only one filler was needed (in which case BC=0 now). Otherwise LDIR to "propagate" the filler from first slot to second, from second to third, and so on throughout the rest of the fill area.

A reverse task is to "strip" some filler characters from the "tail-end" of a block in memory. A typical application is to strip excess blanks from the end of a string. On ENTRY

HL=> begin of block
BC = size of block
A = character to strip

```
;-----------------------------------------------------------
STRIP:  PUSH    HL          ;save begin
        ADD     HL,BC       ;add size
STRIP2: DEC     HL          ;back down
        EX      AF,AF'      ;save A
        LD      A,B
        OR      C           ;null?
        JR      Z,STRIP4    ;yes, done
        EX      AF,AF'      ;restore A
        CP      (HL)        ;strip it?
        JR      NZ,STRIP4   ;no, done
        DEC     BC          ;count down
        JR      STRIP2      ;more
STRIP4: POP     HL          ;get begin
        RET
;-----------------------------------------------------------
```

After adding size to the begining address of the block the pair HL points to the address one byte above the last byte of block, so DECrement it to point to the end byte. Save the test character, check if size of block at this point might be zero and if so then quit. Else get the test character and compare with the end byte of the block. If different then we're done. Otherwise DECrement the size of block and go see if there is more. On return HL again points to the beginning of the block, and BC has its remaining length

(BC=0 if nothing remains). Also Z-flag is setZ if nothing remains, otherwise it's NZ. Of course the "stripped" tail-end of the block does not disappear from memory, but we now know the size of its "valid" front part.

But why not use CPD here? It would seem natural. Maybe, but our approach has two advantages: it prevents errors if we have a "null string" to begin with, and on return Zero flag conveniently tells us if the remaining string has any characters left at all.

The same idea could be used to strip "leading" blanks, etc. One ENTRY

HL=> begin of block
BC = size of block
A = character to strip

```
;---------------------------------------------------------
STRIP1:     EX      AF,AF'  ;save A
            LD      A,B
            OR      C       ;BC=0 ?
            RET     Z       ;yes, else
            EX      AF,AF'  ;restore A
            CP      (HL)    ;strip it?
            RET     NZ      ;no, done
            DEC     BC      ;count down
            INC     HL      ;next byte
            JR      STRIP1  ;more
;---------------------------------------------------------
```

Again, on return HL points to the first valid character, BC=length remaining, and Z-flag is set Z if nothing remains.

Sometimes we don't want to "strip" but only "skip" some characters before displaying a string. For example to skip leading zeros in a string of digits terminated by "carriage return" byte 13:

HL=> beginning of string

```
;---------------------------------------------------------
SKIPS:  LD      A,(HL)  ;character
        CP      13      ;terminator?
        JR      Z,SKIP2 ;yes, else
        CP      '0'     ;skip it?
        RET     NZ      ;no, not '0'
        INC     HL      ;else next
        JR      SKIPS
SKIP2:  DEC     HL      ;back off
        RET
;---------------------------------------------------------
```

On return HL points to the remaining portion of the string, ready for display. If there were only zeros then we hit the terminator and back off to display at least one zero. Or modify that to skip leading blanks, etc.

Often we need to know if a byte is within certain range of ASCII codes. For example to see if it's a digit:

```
;---------------------------------------------------------
RANGE:          CP'0'           ;is it >= 0?
        RET     C               ;no, else
        CP      '9'+1           ;is it <= 9?
        CCF                     ;flip carry
        RET
;---------------------------------------------------------
```

If the byte in register A is '0' or greater then maybe it's a digit and we check if it's greater than '9' (compare it with the next higher character). If it's greater then Carry is reset, so we "complement" it. Thus in any case on return Carry is set C if the byte is out of range, and reset NC if within range. To test for upper case alpha characters we would first compare with 'A' and then with 'Z'+1 and so on.

Finally a challenge for the Holidays: the first bona-fide student of our tutorials (no seasoned experts, please) who correctly provides a brief description of the logic and missing comments for the following monster, will receive from "Computer News 80" a free copy of any one book by Christopher Fara. This procedure converts a string of decimal ASCII digits into "fixed point" format. Excess decimal places are chopped off and missing decimal places are "padded" with '0's. On return B=length of "fixed" string. If the "fixed" length should run over 255 bytes (why can that happen?) then on return B=0 and Zero flag is set Z. What happens if on entry B=0 ("null" string)? If no decimal places are desired, the procedure is called with A=0 and returns an "integer" string without decimal point. On ENTRY:

HL=> string
B = length of string (0-255)
A = number of decimal places

(Ed. Note:) So that the contest program would not be broken by the end of the page we have placed the complete listing on the following page. Good Luck.)

```
;-----------------------------------------------------------
DEXFIX: PUSH    HL
        OR      A
        EX      AF,AF’
        LD      C,B
        LD      B,0
        INC     C
DEXFI1: DEC     C
        JR      Z,DEXFI4
        LD      A,(HL)
        CALL    RANGE
        JR      C,DEXFI2
        INC     B
        INC     HL
        JR      DEXFI1
DEXFI2: CP      ’.’
        JR      NZ,DEXFI4
        EX      AF,AF’
        JR      Z,DEXFI8
        EX      AF,AF’
DEXFI3: INC     B
        INC     HL
        DEC     C
        JR      Z,DEXFI6
        LD      A,(HL)
        CALL    RANGE
        JR      C,DEXFI6
        EX      AF,AF’
        JR      Z,DEXFI8
        DEC     A
        EX      AF,AF’
        JR      DEXFI3
DEXFI4: EX      AF,AF’
        JR      Z,DEXFI8
        EX      AF,AF’
        LD      (HL),’.’
DEXFI5: INC     B
        JR      Z,DEXFI9
        INC     HL
DEXFI6: EX      AF,AF’
        JR      Z,DEXFI8
DEXFI7: DEC     A
        EX      AF,AF’
        LD      (HL),’0’
        JR      DEXFI5
DEXFI8: OR      B
        JR      NZ,DEXFI9
        INC     A
        JR      DEXFI7
DEXFI9: LD      (HL),13
        POP     HL
        RET
;-----------------------------------------------------------
```

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WHAT IS IT? "How To Identify A TRS-80 Model I Microcomputer" Part One

by Arthur N. McAninch, Jr.

One day the phone rang, and the voice of a stranger told me he had a Radio Shack Model III computer he needed help with. After getting his name and address, I gathered up a box of diskettes for the Model III, and hopped in the car for the short trip to his home. Upon arriving, he showed me into a small den where a strange assortment of grey boxes with dangling cords resided on a card table. It was quite obvious that this was not a Model III. What the gentleman had was a Model I keyboard, a Model I monitor, a Micro Mint Expansion Interface, an MTI disk drive, and a Model III Disk Owner's Manual! Fortunately, he also had a diskette copy of TRSDOS 2.2, so I had him up and running in short order with his Model I! This fellow had assumed that the manual must be the right one, and since the Model I does not have a model number anywhere on it, he was certain that he had a Model III. I only needed to show him the pictures in his manual for him to discern that there was an obvious difference between the manual and the actual computer he had.

More recently, I received a long distance call from a fellow who had purchased a TRS-80 keyboard, monitor, and an expansion interface at a Ham Trade Fest. He was unable to get it to do anything with the disk drive. A fellow ham had a Model III, and had kindly brought over a TRSDOS 1.3 disk to try out. Naturally, the TRSDOS 1.3 would not boot up at all. After sending him a copy of TRSDOS 2.3, a Model I TRSDOS and DOS BASIC Manual, he called again saying it would not work. It turned out that he had a bad power transformer for the expansion interface. Yet another phone call was from a similar case who had one too many power transformers, and didn't know where to plug the third one in!

Well, let's get some basics out of the way. So you fell heir to a Radio Shack computer, and you don't know how to turn it on? The first thing to do is to attempt to identify what type it is, then figure out how to connect all the wires, and then how to turn it on. Next, you will want to make it "do something." In later articles, we will help you identify just what modifications your computer has or does not have, several modifications you can make, Double Density, and differences between different DOS's, as well as detailed instructions to get the most out of TRSDOS 2.3.

If you have several grey boxes with a number of wires and cables, and each grey box says "Radio Shack TRS-80 ....", chances are good that you have a Model I. Don't jump to conclusions if you have never seen one before. It could be a Model III, a Model II, or an early COCO I. Now, if each separate unit weighs about 100 pounds, is as big as a filing cabinet, and you get a hernia each time you look at it, chances are pretty good that you have a Model II. If so, it will probably say "Radio Shack TRS-80 Model II Microcomputer" on the front of the main unit. This article will not deal with the II/12/16/6000 family of computers. If the keyboard, monitor, and disk drives (or at least designated space for disk drives) are all contained in one grey case, then you probably have a Model III. The name plate should say "Radio Shack TRS-80 Model III Microcomputer." If the case is white, then this is probably a Model 4 or 4D, and the name plate says, "Radio Shack TRS-80 Model 4 Microcomputer" or "Tandy TRS-80 Model 4D Microcomputer System." If the screen is about 5" wide and there is a slot under the screen where the keyboard can be stored, and there is a cover to go over the screen and the disk drives, then you probably have a Model 4P. This article will not deal with the III or the 4, nor will we discuss the COCO I/II/III.

If one of the boxes says "Radio Shack TRS-80 Expansion Interface", then you may conclude that this is a Model I Interface. Hopefully, the keyboard and the monitor are for the Model I, also. If the monitor says "Radio Shack TRS-80 Video Display", then it is for the Model I as well. If it looks like an old RCA black and white TV set in a grey case without a channel selector, that is exactly what it is.

There should be a grey cable coming out of the front of the monitor with a male 5 pin "din plug" on the end of it.

Let's take a look at the monitor. On the back of the monitor you should find a manufacturer's plate that indicates it was made in Taiwan. This plate is usually white and not like the ones on the keyboard and E/I. There should be a catalog number 26-1201 stamped on it. Just like everything else with the Model I, don't be too surprised to find this plate missing and several strange modifications. I have one monitor in which someone installed an internal audio amplifier with a loud speaker to provide sound from the cassette jack of the keyboard. I saw another one that had been used on the Radio Shack assembly line as a test bed that had provision to function as a monitor to test Model III chassis'! Basically though, the monitor should be in a grey case and is, in reality, a modified old RCA black and white TV set.

On the bottom of the expansion interface you should find a manufacturer's name plate. If so, look at the Catalog Number and the serial number. Write both of these numbers down. The catalog numbers for E/I's manufactured by Radio Shack were 26-1040, 26-1041, and 26-1042. All three are basically the same with the distinction of the amount of RAM memory that was factory installed. If you don't have an Expansion Interface (E/I), then you will not be able to operate disk drives. You will be limited to programs that you type in or load from cassette tape. Ignore all mentions of the E/I.

Now look at the keyboard. If it says "Radio Shack TRS-80 Microcomputer System" just above the top row of numeral keys, and on the right end of the keyboard is a separate set of numeral keys, then you probably have a Model I computer with a decimal keypad. If the keyboard says on the right end within a rectangular block about 2 by 3 inches, "Radio Shack TRS-80 Micro Computer System", then you probably have a Model I without the decimal keypad.

Next, turn the keyboard over and look for the manufacturer's name plate with serial number. Here you will find the deciding factor. If you have a Model I, you will find one of these catalog numbers: 26-1003, 26-1004, or 26-1006. Write this number down, and while you are at it, write down the serial number. Note also any suffix after the catalog number such as 26-1006D. This will be helpful later when you talk to some knowledgeable person. Don't be alarmed if the catalog number is something like 26-10040-1, as this is a 26-1004 with a later modification. It is possible you may have stumbled upon a keyboard with no manufacturer's name plate. This is either a stolen computer or it may very well be one of Tandy's own for internal use that was finally released when they totally dropped support of the Model I. You should look to see if there is evidence of scratches where a name plate may have been scratched off. I have several of these without name plates myself, but all of the ones I have were used internally by Radio Shack in their production testing, Quality Control, Engineering, or Executive divisions, and were never intended for sale.

The catalog numbers will indicate what configuration it had when the keyboard left the factory. The original Model I had only a keyboard unit and a monitor. The keyboard had only a Level I ROM, only 4k of RAM memory, no decimal keypad, and UPPER CASE letters only. Most -- but certainly not all -- keyboard units still in circulation have had Level II ROM, 16k of RAM, a decimal keypad, and lower case capability installed as upgrades from Radio Shack. Some have had 64k of RAM, and a few have had even a megabyte of RAM installed within the keyboard as individual hardware hackers and a few "after market" companies have marketed their own modifications. Other such modifications have included CP/M adaptors, speed ups, and alternate character sets. I have one with alternate Greek characters as well as a CP/M adaptor, and another with alternate French characters.

All right, you have tentatively identified your find as a Model I keyboard with a monitor. Let's hook them up, turn it on, and see for certain what it can do. First of all, connect the grey cable from the monitor to the keyboard with the din cable. If you orient the keyboard in a manner that you would most conveniently type on it, then the monitor (video display) connector is the center one of the three female din connectors to the right on the back edge of the keyboard. Note that these three connectors are identical! Look very carefully at these three din sockets on the back of the keyboard in good light. You will see that each one is labeled. One is labeled TAPE (the outboard socket), another VIDEO (the one in the middle of the three), and one POWER (the inboard socket). Next to the POWER socket is a push button labeled "ON". This push button is the Power ON-OFF switch. While looking on the back edge of the keyboard, look down near the other end where you will find the edgecard connector that is called the Expansion Interface Connector. This is where we will connect the cable to the Expansion Interface shortly. Just near the outboard end of this connector and just below it is another push button switch that is not labeled. This is the RESET button. Remember where this is -- you will use it very, very often!

CAUTION: DO NOT CONNECT THE POWER TRANSFORMER TO THE WRONG PLACE! If you do, when the smoke clears, you will find that you have done major damage to the circuit board! Now find the power transformer. It is usually black, about 2 1/2 inches by 3 1/2 inches and about 3 inches high with an AC power cord and a grey cord to a din plug. Plug the din plug into the inboard most 5-pin female din jack on the keyboard unit. You may not be immediately aware of a power transformer. The Expansion Interface made by Radio Shack has space within it to mount two such transformers internally in an attempt to make things look a little neater (this is hopeless with a Model I!).

Take a good look at the E/I. If there are three wires hanging out of the back of the E/I, then you probably have two transformers inside. Go ahead and remove the four screws on the top of the E/I for the panel on the right end. This is the panel that covers the transformer compartment. The other panel covers the RS-232 interface compartment. You may want to take a look inside this compartment while you are at it. If you open the RS-232 compartment, just note whether or not there is a circuit board installed there. DO NOT loosen the screws that mount the RS-232 board! As you open the transformer compartment, see if there are two transformers there. If so, one of them should have its din cord plugged in to a din socket within the E/I. This one is to provide power for the E/I. The other transformer should be just sitting there with both its AC line cord and its din cord hanging out the back. If you so desire, you may remove both transformers and let them sit on the table behind the E/I. This will allow the E/I to run a lot cooler. Heat is one of the big problems with the Radio Shack design. Re-install the panels. If there are little plastic doors covering all the edgecard access ports on the E/I, you should remove them and get rid of them. The openings will allow the E/I to run cooler, as well. The transformer that is NOT connected to the E/I is intended to provide power for the keyboard. Its din cable needs to be connected to the inboard din socket on the keyboard as we said in the previous paragraph. Just as we mentioned before, don't be surprised to find some strange modifications. I ran across one E/I that had a home made transformer circuit board installed in place of the removable transformers. This is an excellent way to replace burned out Radio Shack transformers, but it is not factory original.

A note about burned out transformers. Should one ever fail you, unplug it from the piece of equipment and from the AC wall plug. Then carefully remove the wax or soft plastic covering the screws on the bottom, and remove the screws. If your transformer was not assembled with screws (and most of them were not), then carefully cut the seal around the bottom with an X-Acto knife. Once you open the transformer case, you will see a fuse soldered into the circuit with solder pigtails. If the fuse is blown, replace it either with a new one just like it or with a fuse holder in which you should install a fuse of like rating as the original. Why they sealed a fuse inside a case, I'll never know.

Now, we need to connect the keyboard to the E/I -- of course, if you don't have an E/I, you can skip this step! You should have a flat, grey, cable about 6 to 8 inches long. It may be very plain or it may have a black box about 2 inches by 3 inches and a half inch thick in the middle of it. If your short cable has the box, this is called a "buffered" cable. Look on the front of your E/I above the port on the front panel that is nearest the left side. If there is a label glued on there that says, "WARNING Use Only With Buffered Expansion Interface Cable", then you MUST use a cable that has the black box in the middle of it. Connect your short cable to the edgecard connector on the back edge of your keyboard so that the cable naturally comes down towards the table from the connector. The smoothest side of the cable should be up, and the ribbed side down. Then connect the other end of the cable to the left edgecard connector on the front of the E/I.

Next, we need to connect up your disk drive(s). Find a long 34 wire cable that has one edgecard connector on one end and two or more edgecard connectors on the other end. The end with the single connector connects to the E/I at the edgecard connector on the back of the E/I next to the left end. Now, the other end of the cable must be connected to your drives. If you have only one disk drive, It should be connected to the connector closest to the E/I. If you have more than one drive (could have as many as four), there must be one connected to the connector closest to the E/I, and then one connected to the next one out, and so on until all four (or less) are connected. Now, there must be at least ONE of the drives with a "termination resistor" installed, and this drive should be the last one in the chain. The Radio Shack drives will be 26-1160 or 26-1164 (had factory installed termination resistor), 26-1161 (no resistor installed -- at least when they left the factory!), 26-1184 (will probably have a resistor). The Radio Shack drive cable had keys in the connectors that connected to the drives and the drives had little slots cut in their connectors so that you couldn't connect the cable in the wrong way. If your drives are not Radio Shack drives and they don't have the slots in their connectors, you will not be able to connect a Radio Shack cable to them until you remove the little keys in each connector. Do NOT jump to conclusions and immediately remove these keys. Chances are pretty good that all of the stuff you received (if you obtained it all from the same person at the same time) all worked together as they are at one time. Your task is to figure out the puzzle so that it will all work again! If you do have a mixture of Radio Shack and other manufacturers' drives and cables, a general rule of thumb is to look carefully at the cable itself. On one edge there should be a dark stripe that is most often red. For Radio Shack drives, this stripe should be down at the disk drive end. For many of the other makes of drives, the stripe needs to be up. Go ahead and hook the drives up in the most logical manner you can. If they don't work, you can reverse the drive connectors without doing harm (provided you don't have the keys and slots we mentioned before.

You will need to locate a din cable that has a din plug on one end and three small phone type plugs on the other. Also locate the cassette recorder and its power cable. The din plug connects to the outboard din connector on the keyboard. The larger grey plug should be plugged in to the MIC socket of the cassette recorder. The smaller grey plug goes in the REM socket. The black plug goes to the EAR jack. If you didn't get a cassette tape recorder with this special cable in your "deal," you can obtain one later. Don't worry about not having one at the moment.

Finally, you need to locate all the AC cords and connect them to a power strip that has a built in spike line filter. You may have one of the original Radio Shack power strips that is black. This one has each AC outlet labeled with the one next to the switch designated for the MONITOR, the next one for the E/I, then one for the CPU, and 5 more numbered 5 through 1 for other accessories such as the disk drives, and a cassette tape recorder. This special power strip electronically insures that all the peripherals are turned on before the CPU (keyboard) is turned on.

Well, you are almost ready to turn on the power. Recheck all cables to insure that they are connected properly. MAKE CERTAIN THAT THERE ARE NO DISKETTES IN ANY OF THE DRIVES! I say again, NEVER turn on or off a Model I computer with diskettes in any of the drives! There is a momentary pulse of current to each disk drive that is guaranteed to erase whatever happens to be under the disk head at the moment! Please observe this WARNING! O.K., turn on the toggle switches on the back of each disk drive. Push in the orange/red power switch of the monitor, push in the orange/red power switch of the E/I (this power switch is recessed and difficult to push unless you use a pencil), push in the power switch on the back of the keyboard next to the POWER din cable. Now, turn on the master switch on the power strip. If you are fortunate, the little red pilot light on the keyboard will come on, and in a few moments the screen will light up on the monitor. If you are watching, the little red indicator light on each disk drive will flash on momentarily and normally in sequence; however, if you happen to have a CP/M modification installed, the disk drive lights will all come on together for a few moments and then go out. The screen will be filled with "garbage" unless you have one of the CP/M modifications that interrupts the normal reset sequence (with this one, you will probably see a readable prompt on the screen). If your screen comes on just saying "READY", then you probably have a Level I keyboard, and this one will NOT function with disk drives. Don't dispare, you may have a keyboard that has been modified with both Level I and Level II within. Check to see if there is a small toggle switch on the back lip of the keyboard or a small slide switch on the right end. If so, switch to the other position and try the RESET again. (I have one that was modified by the Tandy engineers for Ed Juge's personal use!). before you attempt to boot a diskette, make this little test first. Hold down the "BREAK" key, while you push the keyboard RESET button (remember, this is the button that is almost impossible to reach on the left end of the back side of the keyboard).

You should see a prompt on the screen such as "MEM SIZE?", or "MEMORY SIZE?" Just press the ENTER key once, and wait a moment. You should see either "RADIO SHACK LEVEL II BASIC" followed by "READY" on the next line, or you may see "R/S L2 BASIC" followed by "READY" on the next line. The second of these presentations indicates the latest ROM BASIC. The first will be an earlier version, but either one is quite fine. Now, type in: P.MEM and press the ENTER key. You should see "?SN ERROR" which stands for "SYNTAX ERROR" if you have Level II, but if you are stuck with LevelI, this will tell you how much RAM memory you have. If you do see the ?SN ERROR, then type in: PRINT MEM and press the ENTER key. Write down the number that appears on the screen. 15871 indicates a Level I keyboard with 16k RAM in the keyboard only. 15575 indicates a Level II keyboard with 16k RAM in the keyboard only. 48331 indicates a Level II keyboard with 16k in the keyboard plus an additional 32k in the E/I. You may have a number around 4000 which would indicate one of the original keyboards with only 4k of RAM. You may have a number near 32000 which would indicate 16k in the keyboard and an additional 16k in the E/I. With aftermarket modifications, you may very well see some different numbers. Whatever number you see, write it down!

If you have a Level II keyboard, and you have at least 32k of RAM memory, you are ready to try booting up a DISK OPERATING SYSTEM (DOS). If you have made it this far, you do have a Model I which should be a very functional and useful computer. Look through the various books, notebooks, and diskettes you received with the computer. You are looking for a diskette that is labeled TRSDOS 2.3. The original factory distribution diskette is a commercially printed label the width of the diskette. The label is black and white, and on the left end of the label says, "Radio Shack TRS-80 Microcomputer System," and on the larger portion at the right says, "TRSDOS TM REV 2.3". Chances are that you can not find an original distribution diskette, but if you have one that says TRSDOS 2.3 handwritten, that will do. Failing this, if you can find a TRSDOS 2.2, or (heaven forbid!) TRSDOS 2.1, these will do for now. It is possible that you have some other Disk Operating System such as, DOSPLUS, LDOS, MULTIDOS, NEWDOS, ZDOS, ULTRADOS, or VTOS (there are a few others, as well). Whatever DOS's you have, protect them! *DO NOT ERASE THESE DISKETTES! DO NOT EVER WRITE TO OR MODIFY A MASTER OR DISTRIBUTION DISKETTE!* Once you do, you can never go back! Most of the software for the Model I is no longer produced. You may possess the ONLY copy in existence! Don't destroy it! Assuming you have found a Distribution Copy or at least a Master Copy of TRSDOS 2.3 (or 2.1 or 2.2), you have your computer all turned on, and you have checked that you have at least 32k RAM, you are ready to boot up with the TRS Disk Operating System. Insert the disk into the drive that is connected closest to the E/I with the disk notch up and the label to your right. You should have a write protect tab on this diskette! Close the door. Now, with your little finger on your left hand press the RESET button and release it. The disk drive light should come on, the disk drive should whirr, and the screen should change to say:

```
TRSDOS - DISK OPERATING SYSTEM
           VER 2.3

         DOS READY
```

Next month Part Two of this article will continue with a discussion on DOS 2.3 on your Model I.

Have a great forever.
-Art McAninch

A VISIT WITH DAVID GOBEN

by David Goben

NEW PROJECTS, SOUND, HIRES, ETC.

A lot of territory will be covered here and in following columns. For article "ammunition", I purchased MC, the "C" language (a MISOSYS product), and version 1.6.x of DoubleDuty. Also, I purchased a pre-assembled external drive kit from MISOSYS for my Model 4, consisting of a 5 1/4" halfheight 360K drive, and a 3 1/2" 720K halfheight microfloppy drive (these 720K drives are like economical hard disks for budget III and 4 users). These will be covered in detail in the future.

Additionally, you may already know that the Orchestra-90 type music hardware interface can be readily produced through CN80, but the actual driver program is in short supply. To solve this, I am working on a driver that will work on both Model III and Model 4 DOS systems. (If you have already written one, let CN80 know -- and give me a break!). Also, -if- enough interest is generated, I will cover composing your own musical selections in future installments of this column.

Stan sent me a MegaMEM board (ANITEK product) on short loan for detailed evaluation, and to see if I could get my yet to be released new spreadsheet (Business Calculator for eXtended Memory -- BCX) to work with it. I did. I will in the future relate programming examples in using

MegaMEM, as well as HyperMEM, SuperMEM, and the XLR8er.

Some of you have been biting at the bit about the second part of my MOUSE article. Well, so have I. I've had so little time recently, due to having so many other irons in the fire. Well, you will find it in CN80 this month. Because of this, I will cut this column a bit short.

MODEL III/4 SOUND

Most of you Model I/III users know that sound is produced by sending data to port 255 (hex FF). Normally this procedure consists of turning on and off bit 0 of port 255 in rapid succession to produce a sound.

This is also true on the Model 4. Like with the Model III, you must connect a sound amplifier to the large gray cassette interface plug. However, also on the Model 4 you can manipulate port 144 (hex 90) to access the internal speaker built into the computer (on the Model 4P, ports 255 and 144 are tied together, so you can use either).

If you have a large collection of Model III machine language games, such as the old STARFIGHTER, ZAXXON, TALKING ADVENTURE, and others, and you are using them from the Model III mode of your Model 4, you might possibly like to convert the programs so that they send the sound out through the Model 4 internal port, rather than through the cassette port. This is actually quite east to do. Using a file monitor, Super Utility, or another disk/file zapper, you can use them to search through the file for the hex byte sequence D3 FF and change this to D3 90. It's that simple. Of course, if you are not a hacker, it may not be.

Sound is produced by sending a rapid succession of control bytes to the sound port. These control bytes consist of the values 1 and zero. You vary the sound by using two delays inserted in the sound routine. The basic theory is to send a 1 value to the sound port, do a delay, send a zero, do another delay, and then loop for a specified count to establish a duration. By changing either of the delay values, you alter the tone.

O=N PATCH PARAMETER

Recently a subscriber saw a patch that I had written in CN80 which used the O=N (OH equals NO) parameter. Since he did not find any documentation in his DOS manual concerning this odd parameter, he refused to use it, and then complained that the patch did not work. Well, the patch WOULD work if he had used the parameter. The O=N parameter tells the patch program not to use the Find line data to first check the information that is already in the file. "O" stands for OPTION. It can only be used with /FIX type files (patch files saved as ASCII data, used in the form: PATCH file USING fixfile).

HYPERMEM AND SUPERMEM

Let's conduct an experiment. Included on the Disk Series disk for this quarter is my program HYPERBNK/CMD. This program performs a non-destructive patch to the Model 4 TRSDOS/LS-DOS 6 system (no file changes), and allows the system to recognize up to 30 banks of extended memory, if you have either the HyperMEM or SuperMEM memory enhancements installed in your computer (available from ANITEK). After installing it, you should be able to use such programs as XMEMDISK/DCT on DAVID'S MODEL 4 SYSTEM UTILITIES DISK to make huge RAM disks, and to take advantage of other programs that use extended memory, such as DoubleDuty, SCRIPSIT Pro, Multiplan, VisiCalc, Busy-Calc, and many others.

What I want you to do is test it for me, and find any bugs that might exist that I may have missed. If by chance a bug does exist, please report them to CN80, and I will personally fix them and provide you with a free update. Of course, you should be sure that it is a bug, and you can describe in intricate detail how to reproduce the bug. You will also need to provide a disk containing a program where it fails to work, and so on. Bear in mind that HYPERBNK will not install itself if 1) HyperMEM or SuperMEM are not installed, or 2) if extended banks are already allocated. Please remember (people will try this), HYPERBNK will -not- work with MegaMEM, and will -not- work with the 128K memory expansion (in fact, it will ignore it). Also bear in mind that HYPERBNK interfaces with the @BANK supervisory call, and so only programs that access extended memory via the @BANK SVC (as they should) can utilize this. If they directly access the hardware, then they may not work, unless you also happen to have installed the sort of memory they expect to work with. Finally, be sure that the DOS disk does not contain any other memory enhancement patches. Installing HYPERBNK is as easy as entering HYPERBNK from the DOS Ready mode.

MULTIPLAN

The reason that Multiplan runs so slow (and I mean S-L-O-W -- even with a speed-up board) is because of its variable width column format. Each time the screen shifts, the video screen display must be completely reconstructed, primarily due to the unpredictability of the variable width columns (fixed column formatting, on the other hand, can be computed out in just a few microseconds). This process is made even slower by the fact that Microsoft did not utilize an "internal" screen, which can be directly written to, and once updated, dumped instantly to the video. They instead chose to use the much slower individual character write supervisory call (@DSP). This means that each character "cell" within the 80 x 24 screen (up to 19,200 characters) must be each written individually to the screen. This is one of the primary reasons why Microsoft scrapped Multiplan, not only for the TRS-80, but for the PC's and others -- too many people complained about its slowness. This is also the reason why Busy-Calc (and BCX) do not support variable width columns, and support internal screen updating.

NEW FILE CABINET HIRES UTILITIES

I have just submitted a new disk for inclusion in the Model 4 section of The File Cabinet *(File Cabinet Disk Number M4HRZ22*, Model III versions will be written if there is enough interest). It consists of 6 machine language utilities, a documentation file, and several sample hires picture files.

HRFXPRT/CMD is for dot matrix printers. HRLSRPRT/CMD is for both laser and deskjet printers. These two programs will print the hires graphics screen to a printer. You can also optionally load a hires file by following the designated command name with the hires file (the hires files will be loaded amazingly fast). These two program can automatically detect and load three different hires file types: 1) standard hires files (usually using the extension /HR), 2) crunched hires files (using the extension /CHR), and 3) supercrunched hires files (using the extension /SHR). Crunched hires file are compressed hires files, which take up much less disk space than normal hires files. Supercrunched hires files, a creature of my own personal creation, are even more compact, and take up a lot less disk space than crunched files.

In addition to simply loading and printing hires files, you can also add special effects by including a number of parameters within parenthesis. Option PAUSE will allow the picture to be displayed on the screen, and wait for you to press any key before printing it. Pressing BREAK will abort this command and return you to DOS. Pressing the slash "/" key will cause the image to be "flipped" on printout. Normally whatever is white on the screen will be white on the printout, and whatever is black on the screen will be black on the printout. This command will flip this state for printer output. You can also use the INV parameter to do this. If the printed picture appears "scrunched", you can use the DOUBLE parameter to double the picture's height by printing each line twice. Other special effects parameters can also be used.

The dot matrix program, HRFXPRT/CMD, will print all files "sideways" at 120 dots per inch.

The laser/deskjet printer program, HRLSRPRT/CMD, will print images "sideways" by default, but by including the XAXIS parameter, the image will be printer horizontally (on its X-axis). By default the images will be printed at 75 dots per inch. But by including the RES=nnn parameter, where "nnn" represents 75, 100, 150, or 300, you can changes the dots per inch resolution. For example, using RES=300 will print the image at 300 dots per inch. Other programs included on this disk include HRCLS/CMD, a program that quickly clears the hires screen. HRVIEW/CMD turns on the hires screen, so you can view it. It will wait for you to press any key before returning you to DOS. HRLOAD/CMD will load hires files very quickly, then wait for you to press any key before returning to DOS (allowing you to view the file on the hires screen). Like with the printing programs, HRLOAD/CMD can automatically detect any of the 3 hires file formats described above. HRSAVE/CMD allows you to save the hires screen to a disk file by following HRSAVE with the desired filename. The file will be saved in standard hires format (you should use a /HR extension for this), unless you you include the CRUNCH or SUPER parameters within parenthesis. CRUNCH will cause the file to be saved in crunched format (you should use a /CHR extension for this). SUPER will cause the file to be saved in supercrunched format (you should use a /SHR extension for this). So if you are into high resolution graphics on your Model 4, you should take a look at this disk.

Well, if I don't stop now, the column will be longer than I promised. So let's shut the doors on this month's installment. See you next month. HAPPY COMPUTING!
-David Goben

UPGRADES - RESULTS OTHERS CAN SEE

-by Douglas Kelley

MODEL 4 AND ME In a corner of my little house sits my Model 4. I am about the only one who ever sees it. Many people do see the visible results of its work. Through the years I have generated a variety of reports, analysis, and a whole host of printouts. A few weeks ago I was looking at some reports I had done on a PC, a Vax Minicomputer, and my Model 4. Laying the printouts side by side, I noticed that you can't tell which reports were generated by which computer.

UPGRADES--THE RESULTS OTHERS CAN SEE: PRINTERS

Upgrading your printer is one method that produces results that are visible to others. My first printer was a Tandy Line Printer VIII. It served me many years and it now serves as my parents' printer. While my friends were still producing printouts in all upper case text in a 5X7 matrix, I had the then "state of the art" 9 pin, lower case, true descenders, compressed printing, and graphics. I could have gotten a cheaper less capable printer, but I made this upgrade as part of my first purchase. This was my first upgrade that others could see.

DAISY and 24 PIN

Daisy wheel and 24 pin printers provided the next level of "visible" upgrade. The advent of laser printers helped push the prices of the other printers down. It was hard deciding which upgrade path to take or even if I should upgrade at all. My old nine pin was banging away as it always had. Since I had it for doing graphics, I chose a Tandy DWP 520 daisy wheel printer as my next visible upgrade. The carbon ribbon and fully formed characters provided easy reading, high quality paper completed the effect.

LASERS

Now that laser printers are becoming more affordable, it is possible to make further visible upgraded. I have enjoyed Computer News 80's article about using laser printers with the Model 4. To laser print, I transfer data to a Vax mini-computer. My article in the September 1990 issue of Computer News 80 describes how to move data from a Model 4 to a Vax computer.

JUST THE FAX MA'AM

There's no need to envy those PCs with Fax Cards. Your laser printer can even do double duty receiving and printing faxes using products like Tall Tree Systems' Fax-O-Matic. Fax-O-Matic sits between your Model 4 (or any computer) and your HP (or compatible) laser printer. It receives the fax and directs it to laser printer. It does not interfere with your use of the Model 4. You do not even have to own a computer to use the Fax-0-Matic. An HP (or compatible) laser printer is all you need. If you had a Model 4P you could disconnect it and take it with you at night (for "homework"). This leaves the Fax-O-Matic and your laser printer to collect faxes for you. While your associates are fumbling with their fax paper rolls, you will have your laser quality fax prints. To send faxes, you can get a cheap fax machine. Using this fax for send only (or send-mostly) reduces your fax paper cost. You would need little (if any) fax paper. The portable PC world has send-only (external) fax modems. These are about half the cost of send/receive (external) fax modems. With the proper driver a Model 4 should be able to use them, since these units connect to the serial port. Here is a project for someone. Write a driver for a popular send-only fax modem. A limited "shareware" version could go into the File Cabinet Collection. Lets say this version can send ASCII text over the fax. The "full" version can send graphics (i.e. Rembrandt, xTcad, ect). Maybe someone could work out a deal with a supplier of a send-only fax modem. Obtain the fax modems (stripped of PC software drivers) at a discount. Provide Model 4 (and Model III) drivers. Sell the "new" products through ads in Computer News 80. Okay you potential entrepreneurs, time to get to work. A send/receive fax modem driver is also an option. This was of interest to a friend of mine. He is putting the idea in the CP/M section of CompuServe to see if there are any takers. Those of you with CompuServe memberships may want to take a look to see if anyone "bites".

PLOTTERS

My company uses a variety of Computer Aided Design (CAD) equipment. This range includes sophisticated design stations to "relatively" cheap 2D drafting stations. Few people see the CAD equipment, but many people see the drawings. You can not tell which stations produced which drawings. You can produce many of the same outputs with your Model 4, software (for example xT.CAD), and a quality plotter.

MULTIPROCESSING

In the plotting example (above) you can use one Model 4 to control your plotter while you are doing your layouts (or any of your other work) on another Model 4. With a laser (or any printer) you can turn one Model 4 into a print station and use another for interactive task. The print spooling software included with the Model 4 DOS can assist in automating this function. Set up the spooling software, per the instruction in your DOS manual. Load your word processor. Print your cover memo to the spooler. Load your spreadsheet. Print your summary to the spooler. Load your data base. Print your report to the spooler. While these jobs are printing on one model 4, you can start work on your next report on another Model 4. With the Model 4 you can spool to memory or disk. Extra disk dives or a hard disk will give you more room to spool your larger jobs. Memory expansion will also give you capacity to spool larger print jobs. Model III LDOS also permits print spooling. I believe DOSPLUS also has a print spooler. I do not know about NEWDOS MODEL 4.

WORKBENCH

I met a self-employed accountant who has an interesting "multiprocessing" set up. The basement (his office) in the old house he bought has a large workbench. He has five Model 4s (and printers) set up on the workbench. Each is dedicated for a different client. The cost of operating each (paper, disks, and ribbons) is billed to the individual client. He wrote the original accounting program (in basic) on a used Model III. He bought extra Model 4s as he was able to get a good buy. He was able to speed up the basic program by using a utility that permitted the Model 4 to run at 4 mz (in the Model III mode). Finally, he got a good deal on the Microsoft basic compiler (for Model III). He told me that he would still use the system (even without the speedups) because it was a cheap solution. Since the computers are dedicated, they are NOT holding up the next job. Within reason, it does not matter when they complete the task. His clients only see the computer's monthly printouts.

MODEMS

Upgrading your modem is another method that produces results that are visible to others. My first modem was inside a Model 4p. It had a 300 baud speed. Communicating with others is noticeable faster with my current modem. It is a clone of a Hayes 2400 baud modem. I can call our Vax computer at night (when the Vax's work load is light) and the screen response seems to be as fast as an inside line (at 9600 baud) during a daytime full workload session. One department, in my company, uses modems to send specifications for test fixtures to the supplier. They used to send the data via floppy disk either through regular mail or overnight mail. The floppy disk were supposed to be returned for re-use but often they were not. Floppy disks would be sent by overnight mail when there was no hurry. Rush jobs would be sent by regular mail by mistake. Sometimes disks were lost. All these factors increased cost. These cost were also hard to trace because they were buried in the general mail cost and general office supply cost. Using the modems made the cost of fixtures traceable. The supplier's phone number (and cost) now show up in telephone accounting. There are no floppy disk to return. The files get to their destination immediately, none are lost in the mail. This cost and time savings is a result that their managers can see.

SPELL CHECKERS

Spell checker software is another method that produces results that are visible to others. My fingers seem to think that I can type faster than I actually can. Since I have "fumble fingers", I find spell checkers useful for finding typos such as transposed characters. Since most of my "finishing" work is on Vax I use one of its spell checkers. There are a number of products available for the Model 4. Some word processors (i.e. LeScript and Type-it-All) have spell checkers built in. I have friends and family members that use Electric Webster as their spell checker. One person I know even has the Electric Webster grammar checker. I have seen Electric Webster work with Scripsit. I have not seen it work with other brands of word processors.

SCRIPTSIT and ELECTRIC WEBSTER

To spell check your document, run your Electric Webster modified version of Scripsit (it is called Escript). Load your documents as you would with Scriptsit. To spellcheck and grammar check your document press the <break> key. Type the letter "E" for (Electric Webster) and the name of a temporary file (the manual suggests) kill/tmp. Electric Webster will review your document and highlight words it does not recognize. You are given the usual options of skipping the word, replacing the word (with EW's best guess), editing the word, or you can see the word in context (and correct it) during a later part of the program. The grammar checking portion offers suggestions and alternatives. You may accept or reject these alternatives. When checking is done, Electric Webster will re-load your word processor and your "corrected" document. You may review and edit the document, then save it. In Scripsit you save the document by pressing the <break> key, typing "S", press <spacebar>, type the filename and extension (i.e. filename/ext) and press <enter>. Then you exit Scripsit pressing the <break> key, typing "END" and pressing <enter>. Remove your Electric Webster temporary file (i.e. kill/tmp). Be careful with spell checkers. It is possible to introduce errors into your document by replacing a correct word (not recognized by the spell checker) with an incorrect word (that is recognized by the spell checker).

FILE TRANSFER SOFTWARE

The transfer of data is another method that produces results that are visible to others. My department was sent some data (from an old project that was being resurrected) on a CP/M floppy disk. The old computer was gone so we could not generate a printout. I took the disk with me. Using my Model 4 (and the the Supercross version of Hypercross) I was able to transfer the data to a MS-DOS disk. I took the MS-DOS disk to the PC lab and transferred the data to the Vax computer.

THANKS FOR THE DATA

The data was updated and used for a cost estimate for the resurrected project. As a sign of appreciation, one of the people involved brought me a disk call PD Games (public domain) for MS-DOS (he also had a MAC version). I thanked him and said I don't have an MS-DOS computer. This confused him, since I had provided the MS-DOS disk for the project. I explained what I did with Supercross. He let me keep the disk. I reformatted it to Model III. Now it is home for Tankzone 2000 and some of my other favorites. My article in the September 1990 issue of Computer News 80 describes how to move data from a Model 4 using the Supercross version of Hypercross.

UPGRADES--REAL WORLD CONNECTIONS.

Real world applications provide another method that produces results that are visible to others. Alpha Products has previously been mentioned in Computer News 80. Their products can be used for a variety of projects. Some examples include measurements (voltage and temperature), remote control, event timing, Lab experiments, motion control, and others. They even have a card that will decode all standard touch tone signals from a telephone.

HOW MANY CARDS -- WHICH COMPUTER:

These cards can be used by themselves or up to five cards can be plugged into their A-bus motherboard. Five motherboards can be linked to provide a total capacity of 25 cards. Alpha products has adapters for Model III/4/4p, Model I, Model 100/200, Tandy Color Computer, Commodore 64, Apple II/II+/IIe, IBM PC/XT/AT (or compatible). There is even a serial port adapter if you don't have one of the computers listed above.

AFFORDABLE

Alpha Products systems are really affordable. The real world products (listed in the various catalogs we use here at work) can cost thousands of dollars. Many of these cards will only work with an AT class computers. Alpha Products has many items under $100, and More in the $100 to $200 range. Their Smart Stepper Controller (at $299) was the most expensive product I saw. Other companies stepper controller can cost $499 and up. Further savings are realized in that you can use just any old computer you happen to have around. There is no need to get an AT class computer. This is another cost saving result that others can see. Many of the visible upgrades (mentioned in this article) are also available to users of Model III. You can take advantage of these many upgrades, and you do NOT have to buy a new computer to use them.

Mentioned in this article is Tall Tree Systems, 2585 E. Bayshore Road, Palo Alto, CA 94303; (415)493-1980. The other products mentioned in this article are frequently seen in articles and Ads in Computer News 80.

-Douglas Kelly

LIVING IN A WELL-DEFINED WORLD By David P. Miller

Last issue we demonstrated the use of mathematical formulas to generate graphics in the form of hypocycloids. If you spent much time playing with the possible combinations of radii, you will have seen that large numbers, especially when the smaller divides evenly into the larger, create quite complex and beautiful displays. The same holds true for the demonstration program in this issue. This month we'll investigate another form of cycloid called epicycloids. An epicycloid, like a hypocycloid, is the representation of the path taken by a point on a circular object moving on a surface. However, the surface in this case is the outside of the larger circle rather than the inside. The formulas used to generate an epicycloid are:

$$x=(A+B)\cos(T)-B\cos((A+B/B)T)$$

$$y=(A+B)\sin(T)-B\sin((A+B/B)T)$$

As with last months' program listings, use World Listing Number One for Microlabs' GBASIC, replace lines as noted in World Listing Number Two for Radio Shacks' BASICG. My apologies for the extreme brevity of this month's column; I promise to have more next time, but the concepts of cycloids have already been explained, and you'd probably rather get at the program and see what it does, anyway, wouldn't you? Until next time - enjoy!

-David Miller

REMINDER

If your label ends with 90/12 this is your last issue. Time to send your renewal payment.

CURING THE KEYBOARD WOES.

by Fred Oberding

I have seen a number of letters and articles on keyboard repair in back issues of CN-80 and thought it was time I added my two cents worth. I don't really recommend using any kind of liquid cleaner or spray on any keyboard, except possibly the printed circuit board and open switches of the 4P, once it is separated from the frame and plungers. The desktop TRS-80 computers with one exception all use semi sealed keyswitches ...... they will let dirt and dust in, but are reluctant to let it back out. Any liquid will just make a gummy mess inside.

The best preventative measure is to keep the keyboard covered when not in use and vacuum in, around, over and under your computer frequently. Hmm, Radio Shack use to sell a hard plastic cover just to cover the keyboard of a 3 or 4; I wonder where I can get one of them now? Also, buy yourself a small one inch wide paint brush and keep it near the computer to brush off the keyboard occasionally. Keep the outside of the keyboard clean and you won't have any problems with your keyboard. The majority of computers I have seen with keyboard problems were usually operated in a filthy environment. Their key caps were black and so covered in grime that you could hardly read the lettering and you felt you should be using rubber gloves to touch it.

I don't want to offend anyone, but this has been my experience in over ten years of repairing computers. I have also seen old Model III's in pristine condition, as if they had just came out of the packing box, except the key cap lettering was all but worn off from heavy use, yet the keyswitches were in good working order. I do not recommend replacing more then 3 or 4 keyswitches, as you will be replacing more next week or next month . . . replace the complete keyboard now. If the top of the keyboard, under the bezel is filthy with dust balls and cracker crumbs . . . replace the complete keyboard and start using common sense preventative maintenance procedures.

The most important preventative measure I can give you, is never, never get so angry and frustrated at your computer, that you hit the center of the keyboard with your fist. Situated under the "H" in all Model III's and 4's, is a post, that is molded into the bottom of your computer case to support normal finger pressure and then some. When the keyboard is wacked hard, that post goes straight through the keyboard pc board and you now need a new keyboard. You may think that I have made this story up, but I have seen at least a dozen such keyboards and have gotten half the owners to admit what they did.

Enough of the lecture, lets get on with keyboard repair. The late Model I, Model III, the early 4 and all 4D's used ALPS keyboards, with easily replaceable keyswitches. Mid Model 4's used MAXI keyboards which also used replaceable keyswitches, but slightly different then the ALPS. How do I tell which keyboard I have, simple, its silk screened on the keyboard pc board. Late Model 4's and all the 3 to 4 Upgrade Kits used a one piece membrane keyboard with attached bezel and cable assembly, which is a throw away with no replaceable parts.

The late Model I and early Model III ALPS use a 2-pin keyswitch, where the late Model III, early 4 and 4D ALPS use a 4-pin keyswitch, as well as does the MAXI keyboard, although it has a different spacing for the pins and is not interchangable with the ALPS keyswitches.

So much for history. I stated earlier that replacing the keyswitches on these keyboards was easy . . . well, I lied a little. The ones located around the perimeter of the keyboard are easy, but they get more difficult as they are located towards the center of the keyboard. Start by unsoldering the 2 or 4 pins from the keyboard printed circuit board. Use a low wattage iron with a good clean small tip. Too much heat can lift the pc trace and you will have to jumper with wire wrap wire. Make sure you are de-soldering the correct pins for the keyswitch you want to remove. Its easy to de-solder half the pins from one keyswitch and half from its neighbor. Use a solder sucker to start and clean-up the joint with solder wick braid. Test to see if the pins are free by trying to move them with your finger nail. If they do not move, use the soldering iron and some more solder wick until they are free.

Now the fun begins. Remove the key cap, either with a key cap removal tool (available from Jensen Tools P/N X797B020 @ $5.50) or a flat bladed screwdriver on the front edge of the cap and your fingers on the back edge. If you are lucky the keyswitch will come out with the cap, but not likely. With the cap removed you will see the plunger sticking up from the switch and the square shoulder base of the keyswitch. In the center of top and bottom edges of the base you should see the indented part of the base that clips the keyswitch to the metal keyboard frame. Moving these towards the plunger will release the switch, but that's easier said then done. For the keyswitches near the edge of the frame, you can slide a small flat bladed screwdriver between the switch and the printed circuit board. Now, as you move the clip towards the plunger, that side of the switch will be forced out of the frame by the pressure of the screwdriver between the bottom of the switch and the pc board . . . repeat for the other side. With a little ingenuity you can use this same procedure for those switches located further in from the edge. Once you have the old switch out you can install the new one, after making sure the pins are straight. You don't want to have to remove this new switch just to straighten the pins. Now, did you install a new switch or put the old one back in! If you are positive you have a new switch installed you can solder the pins that are sticking through the pc board, if the pins aren't sticking through the pc board . . . guess what! OK, now that we have our new switch properly installed we can put our computer back together. Those of you that don't want to take my advice on replacing the entire keyboard, can now finish replacing the other 20 keyswitches, while we get back to enjoying our computer again.

Not to leave you 4P owners out, but you shouldn't experience as many keyboard problems as desktop owners. I have probably replaced 4P keyswitches on a ratio of 1 to 100 desktop switches. The 4P key switches are of an open contact construction, but tend to be more reliable then the sealed or semi-sealed type.

To open up the 4P keyboard case, remove the eight screws from the bottom of the case. Only see seven, you say. Number eight is under the center of the black rubber anti-skid strip at the front bottom edge of the keyboard. You should be able to put finger pressure on the center of the strip to find the screw hole and either use an X-acto knife to trim the hole or peel the entire rubber strip off. Once you have the keyboard open, note how the folding legs are situated so you can put them back in correctly.

You will need to remove the printed circuit board from the frame to get at the keyswitches. First remove the screw and nut attaching the ground strap, then remove the 17 tiny phillips screws and try not to lose any. De-soldering the old keyswitch is straight forward, but the new switch might give you a fright and cause you to swear at Radio Shack for sending the wrong part. If you will sit the old and new switches side by side, you will note that the only difference is the extra strip of metal between the solder pins on either side. Just bend this strip back and forth and it will break off, but be careful not to break off the solder pins also. Some switches may come with this extra strip of metal already removed, so if your new switches look exactly like the old ones, don't worry. Solder in the new switch and put the keyboard case back together again.

So, now where do I get these new keyswitches and keyboard parts you ask, well from Radio Shack National Parts of course. You can call them at 800-442-2425 and use your plastic charge card and if you are in a hurry, and want to pay for it, they will send them over night express. If you want to chance fate, you can still let your helpful local Radio Shack store order them for you. Listed below are the Radio Shack part numbers you will need to order your parts and they will want to know the catalog number of your computer, the 26-xxxx number from the label on the bottom.

Nomenclature	Part Number	Cost o/a 10/01/90
Model 3/4 reset switch	AS-2761	$2.07
2-pin ALPS keyswitch	AS-2762	1.30
4-pin ALPS keyswitch	AS-7567	1.00
4-pin MAXI keyswitch	AS-3069	2.98
Model 4P keyswitch	AS-0001	1.00
Keyboards:		
Model I 65-key ALPS	AXX-0202	95.00
Model I 53-key ALPS	AXX-0203	21.00
Model III ALPS	AXX-0217	57.56
Model 4 ALPS	AXX-0216	NLA
Model 4P	AXX-0299	50.34
Model 4D ALPS	AXX-0243	37.98
Model 4D bezel	Z-8553	9.39
Model 3/4/4D cable	WA-0260	11.34

As you will note from the above, the Model 4 ALPS keyboard is no longer available, this is also true of the Model 4 MAXI and one-piece membrane keyboards. (For you doubting Toms, the part numbers for the Model 3 and 4 keyboards have not been transposed, the 3's number is the higher one.) Model 4 owners that need a new keyboard will have to replace with a Model 4D keyboard and bezel. The keyboard cable listed has a built in header at the keyboard end, and not a socket like the older 3/4 cables; you will have to desolder the right angle connector from the keyboard and solder the cable directly to the keyboard. As always with these keyboard printed circuit boards, be very careful and don't use too much heat, or you will lift the traces, particularly around the cable connector.

Key caps are also available for just about all of the keyboards, but they are no longer sold individually. They are sold as sort of a grab bag assortment for about two bucks or so, a bargain as the individual caps use to be a buck each. They are too numerous to list here and the National Parts 800 number may refer you to Parts ID. Call 817-870-5600 which is National Parts' switchboard and ask for Computer Parts ID. Have your computer model number (26-xxxx) ready and whether its an ALPS or MAXI keyboard. If you don't have any luck, you can contact me through CN-80 or give me a shout on CompuServe on the LDOS SIG (GO PCS49), my PPN is 72177,1106.
-Fred Oberding

FILE CABINET UPDATE
A CN80 Staff Report

We are working steadily on improving the File Cabinet Library Collection and so far we have cleaned up the Utility files of the Mod 4 Catalog and soon hope to have the Business, Games, Education and Communication sections completed. Until they are completed we will not be issuing a new catalog disk. What we have accomplished is going thru all 1400 of the existing Model 4 Utility programs and trashing any junk files, or files that were written for a specific users system that might reconfigure your system when running the program. We have added documentation where docs were missing for the programs that were left.

This has been a major project and has taken longer than expected. So if you order Model 4 Utility Volumes you may find that the list on that disk does not match with your existing Mod 4 Catalog. All the files that were kept are on the same disk as they were originally. Only the junk or programs that did not run properly were taken off. Rest assured that now if you order a disk of programs that the programs will run.

As soon as this process is completed with the other classifications in the Model 4 Collection, (about February of next year, we hope) then we will issue a complete new Model 4 Catalog, and start on the cleanup of the Model 3 and Orchestra 90 Catalogs.

While we are waiting for the new catalogs to be completed all new listings to the File Cabinet will be published in CN80, so you can have access to them. They will only be listed once, so you need to save each new list. As soon as the new catalog is ready we will announce it in CN80 and you can then send in your old catalog for upgrading. There will be no charge when this takes place. You have to send us your existing catalog disk and pay the postage to us. We will upgrade your disk and return it to you. Please do not send all the Catalog Disks that you have. Only the Catalog announced. It will be awhile till the Mod 1/3, and Orch 90 catalogs will be ready for upgrade. If you send in all your catalogs it would only cost you and us extra postage and you will get the same disk back if a new catalog is not upgraded yet.

CLAN UPDATE

The Clan Genealogy program by Arthur C. Hurlburt *(File Cabinet Disk Number MD3EDU38)* is the original version of the Clan Program and operates only under TRSDOS 1.3. This disk is sent with the disk formatted with TRSDOS 1.3 so it does not have to be converted from the single-sided single-density 35 track format that the rest of the Model 1/3 Library uses.

As users of the Clan program already know, the program is written in BASIC and has the print driver commands that were for the author's C.Itoh printer. Thus you had to rewrite the print driver program lines to fit your printer. A little tricky if you aren't an experienced Basic programmer. Plus, you have to create four disks to use the program, each of which uses a different basic program. So you have to rewrite the printer command lines in three basic programs with your printer instructions.

We asked David P. Miller, author of PostMaster if he would take a look at the program and write it using generic printer commands for the printers that emulate the Epson FX80 mode. These are third party printers such as the Seikosha and Panasonic printers. Radio Shack printers do not have an exact Epson FX80 mode, Tandy uses a code that they call the "Tandy Standard Mode", which is a modified Epson standard.

David went one step further. He created the four disks for us. Rewriting the printer driver codes in each basic program module with pure ASCII codes, so that the the CLAN should work on about any printer. But it still requires the TRSDOS 1.3 operating system and its BASIC.

These four disk have not been placed in the File Cabinet. If you would like to order the CLAN program on the rewritten four disks, then send us a note telling us you would like the FX80 Version of Clan on Four Disks, and include $10.00. We will pay the postage to send you the four disks.

After being exposed to the program David Miller might now be in the mood to write a Model 4 genealogy program for us. So far we have not found a genealogy program for the Model 4 which comes close to the way that CLAN handles the subject and will build a family "tree" printout. We also have David's mother who is actively interested in genealogy to help us push the idea along. If he does get the bug and write a genealogy program, looking at his PostMaster product, it certainly would be well worth having.

Stay tuned, we also have a couple of other expert programmers who have been bitten by the genealogy bug.
-CN80

MONTEZUMA CP/M UPDATE

Not enough space has been left in this issue to cover all the amazing things (for someone new to MM-CP/M) that Montezuma Micro's CP/M package will do. But we can tell you this, there will be much more about CP/M in our coming issues.

Experienced users of CP/M are invited to send in their experiences, and to share their knowledge with us.

Monte's PUBLIC DOMAIN LIBRARY

If you noticed, these disks are on Montezuma Micro Single Sided Super Data Format which allows 220K of a single sided 5-1/4 disk. Many of these files are arched (compressed program files) that need to be de-arched with the program which is supplied either on the Catalog Disk #C000, or #C900 Monte's Essential CP/M Utilities. This compression along with the 220K storage space allows many more large programs to be place on a disk than could be placed on a standard format. If you are new to CP/M or to de-arching files, don't let that scare you. It is a simple fool-proof system, menu driven that Monte has supplied and is very simple to use.

If you order the Catalog disk; use the de-arch program provided on it; then print out the catalog, you will get a catalog of 90 single spaced, 60 lines per page, full descriptions of each program available, from Adventure to Zilog mnemonic assembler.

We had considered printing this catalog for you in the same fashion that we have printed the PostMaster Icon Catalog, but the cost would be much more than the $4.00 for the CP/M Library Catalog Disk. If there is enough interest we certainly would consider printing it, so let us know.
-Cottin Picken Maverick

WORLD LISTING NUMBER ONE - WORLD4/BAS By David P. Miller

```
1 REM Generate an Epicycloid figure
2 REM Requires Microlabs' GBASIC
3 REM Written by David P. Miller
4 REM for Computer News 80 Magazine
5 REM Original concept by
6 REM Florence & Sheldon Gorden
10 @OFF:CLS:@CLS
20 INPUT "Large radius (1-32767, 0 to quit) ";AA
30 IF AA>32767 THEN GOTO 20 ELSE IF AA=0 THEN SYSTEM
40 INPUT "Small radius (1-32767) ";BB
50 IF BB>32767 THEN GOTO 20
60 IF BB>=AA THEN CC=AA:AA=BB:BB=CC
70 C1=AA+BB:C2=C1/BB
80 DEF FN X(T)=C1*COS(T)-BB*COS(C2*T)
90 DEF FN Y(T)=C1*SIN(T)-BB*SIN(C2*T)
100 A=0:B=6.28*BB:N1= -C1-AA:N2=-N1:M1=N1:M2=N2
110 D=(N2-N1)/600:E=(M2-M1)/200
120 NR=20*(AA+BB):IF NR>400 THEN NR=401
130 OH=INT((FNX(A)-N1)/D+.5)
140 OV=200-INT((FNY(A)-M1)/E+.5)
150 ST=(B-A)/NR:@ON1
160 FOR T=A+ST TO B STEP ST
170 X=FNX(T):H=INT((X-N1)/D+.5)
180 Y=FNY(T):V=200-INT((Y-M1)/E+.5)
190 @LINE (OH,OV,H,V,1):OH=H:OV=V
200 NEXT T
210 T$=INKEY$:IF T$="" THEN GOTO 210 ELSE GOTO 10
```

WORLD LISTING NUMBER TWO Changes for Radio Shacks' BASICG

```
10 SCREEN 1:CLS:CLR
150 ST=(B-A)/NR:SCREEN 0
190 LINE (OH,OV)-(H,V):OH=H:OV=V
```

NEW ADDITIONS TO
CN80'S FILE CABINET LIBRARY

Volume Disk Number Description

ICON REFERENCE GUIDE $10 includes shipping. Free if ordered with 15 or more disks and shipped with order. If the Reference Guide is ordered by itself, a credit of $10 will apply to your first order for 15 or more disks.

NEW ADDITIONS TO THE MODEL 4 CATALOG

Volume Disk Number		Description
M4EDU30	INDEX PROGRAM AND DATA FILES FOR ALL OF THE 80 MICRO MAGAZINES	
	MICRO80/BAS	Index Basic Program Load into Basic to read /DAT files.
	MICRO80/DAT	Data files for 1980
M4EDU31	MICRO81/DAT	Data files for 1981
M4EDU32	MICRO82/DAT	Data files for 1982
	MICRO83/DAT	Data files for 1983
M4EDU33	MICRO84/DAT	Data files for 1984
	MICRO85/DAT	Data files for 1985
M4EDU34	MICRO86/DAT	Data files for 1986
	MICRO87/DAT	Data files for 1987
	MICRO88/DAT	Data files for 1988

NEW ADDITIONS TO THE MODEL 1/3 CATALOG

Volume Disk Number		Description
M3EDU39	MODEL 3 INDEX PROGRAM AND DATA FILES FOR 80 MICRO MAGAZINES	
	M3INDEX/BAS	Index Basic Program Load into Basic to read /DAT files.
M3EDU40	MICRO80/DAT	Data files for 1980
M3EDU41	MICRO81A/DAT	Data - Half of 1981
M3EDU42	MICRO81B/DAT	Data - Half of 1981
M3EDU43	MICRO82/DAT	Data files for 1982
M3EDU44	MICRO83/DAT	Data files for 1983
M3EDU45	MICRO84/DAT	Data files for 1984
M3EDU46	MICRO85/DAT	Data files for 1985
M3EDU47	MICRO86/DAT	Data files for 1986
M3EDU48	MICRO87/DAT	Data files for 1987
	MICRO88/DAT	Data files for 1988

The M3EDU39 program disk and the data files can be copied to a TRSDOS 1.3 formatted disk using the Convert program of TRSDOS 1.3. The Index program was written for TRSDOS 1.3 Basic

Volume Disk Number Description

ADDITIONS TO THE ICON CATALOG

Volume Disk Number	Description
M4PMLAH	Additional Boarder Files
M4PMLAI	Additional New Fonts
M4PMLAJ	Additional New Fonts

ADDITIONS TO THE MODEL 4 CATALOG

(CORRECTION: MD4UTL60 Listed in V3#10 should be MD4UTL61) David Goben's Latest version of his UTILITY4 program.

Volume Disk Number		Description
	UTILITY4/CMD	Utility program command file.
	UTILITY4/DOC	Documentation file for Utility 4 program
M4HRZ21	Hi Resolution Programs for Laser and DeskJet Printers by Gary W. Shanafelt	
	BCHRLOAD/CMD	Hi Res Utility Programs
	HPPRINT/BAS	Hi Res Print Program in Basic
	HPPRINT/DOC	Hi Res Documentation for HPPRINT/BAS
	BWLADY/HR	Hi Res Picture File
	GEISHA/HR	Hi Res Picture File
	MANDRILL/HR	Hi Res Picture File
	ROBBIE/HR	Hi Res Picture File
	TRS80/HR	Hi Res Picture File
	MAST/HR	Hi Res Picture File
	MERCEDES/HR	Hi Res Picture File
M4HRZ22	Assorted Model 4 High Resolution Utilities by David Goben	
	HRPGMS/DOC	Doc file for HiRes Utility programs
	HRLSRPRT/CMD	Laser Printer HiRes printer utility
	HRFXPRT/CMD	FX/RX (and other EPSON) HiRes printer utility
	HRLOAD/CMD	HiRes file loader
	HRSAVE/CMD	Save HiRes screen Data to a disk file
	HRCLS/CMD	Clear HiRes screen from DOS level

NEW ADDITIONS TO

CN80'S FILE CABINET LIBRARY

Volume Disk Number		Description
	HRVIEW/CMD	View HiRes screen from DOS
	BWLADY/SHR	Enchanting lady
	CHEETAH/SHR	Mellow cat
	LADY/SHR	Mysterious lady
	MODEL4/SHR	Beloved Model 4
	MODEL4P/SHR	Beloved Model 4P
	TIGER/SHR	Friendly tiger
	VANNA/SHR	Vanna smiles
HRPIC14	Hi Resolution Pictures by R. M. Gilfillan	
	ALFRED/HR	Alfred E. Newman (Mad Magazine)
	BAT/HR	The Bat Symbol
	BULL/HR	No Bull Symbols
	COKE/HR	Coca Cola (Classic)
	HITEK/BLK	HiTech alphabet block file for Draw Program
	KNIGHT/HR	Knight on a horse
	MICKEY2/HR	Mickey Mouse
	PIRATES/HR	Pittsburgh Pirates
	ROYALS/HR	K. C. Royals emblem

All of the above are originals, created with Micro-Labs Draw program (Model 4 mode). Nothing has been copied from other public domain disks or other sources. - R. M. Gilfillan

These are really exceptionally good graphics, by an exceptional hi-res artist (CN80-Ed.)

Volume Disk Number Description

MODEL 4 LIBRARY SOFT FONTS

This is an entirely new division to the Model 4 File Cabinet Library and it contains the downloadable soft font files for Laser and Deskjet printers.

Volume Disk Number	Description
M4FON1	Laser - Palantino Soft Fonts Disk #1.
M4FON2	Laser - Palantino Soft Fonts Disk #2.
M4FON3	Laser - Palantino Soft Fonts Disk #3.
M4FON4	Laser - Optima Soft Fonts - One Disk.
M4FON5	Laser - Calligraphic Fonts- One Disk.
M4FON6	DeskJet- Times Roman Fonts- One Disk.
M4FON7	DeskJet- Helvetica Fonts -- One Disk.
M4FON8	DeskJet- Optima Fonts ---- One Disk.
M4FON9	DeskJet- Chancery Fonts --- One Disk.
M4FON10	DeskJet- Palantino Fonts -- One Disk.
M4FON11	DeskJet- Gramond/Hobo ----- One Disk.
M4FON12	DeskJet- Century Fonts ---- One Disk.
M4FON13	DeskJet- Deutshe Fraftur -- One Disk.
M4FON14	DeskJet- Avant Garde Fonts -One Disk.
M4FON15	DeskJet- Blippo Fonts ----- One Disk.

As more soft font disk become available they will be added to this section. Because it is not possible to print samples of the fonts in an electronic disk catalog, or in CN80 because of the space it would consume. We are preparing a soft font reference guide and catalog. Anyone who woul like to have this catalog, please send $2.00 with your request to cover postage and handling.

Avant Garde, Baskerville, **Benguiet Bold,**
Broadway, Broadway Engraved. Hobo: 10, 15.

Deutsche Fraftur: 10, 12, 20, 12 bold, 20 bold. Times Roman: 8, 10, 12, 14, 18, 24

Galaxy, **Rockwell,** **Blippo** University Roman. **Cooper** Century

Helvetica: 8, 10, 12, 18, 24 *Chancery*

Optima Garamond

Palatino

Public Domain Soft Fonts

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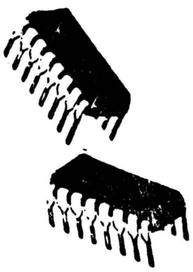

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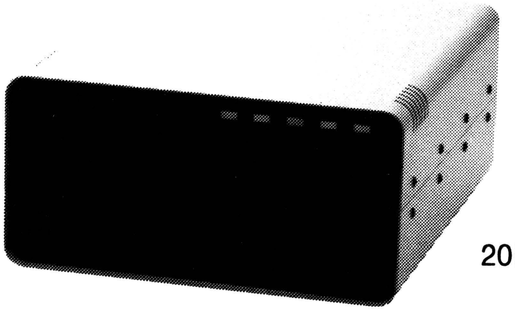

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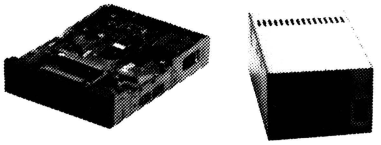

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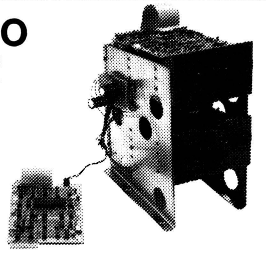

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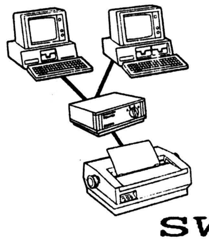

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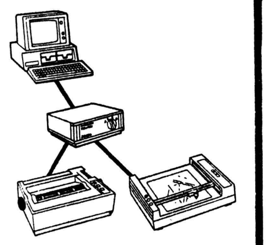

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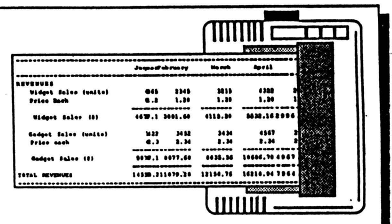

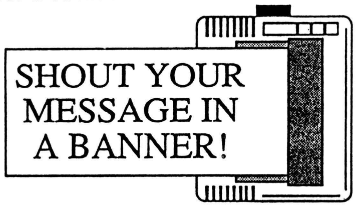

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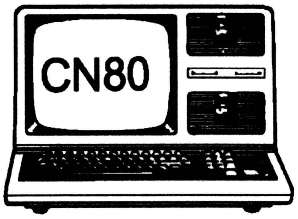
MARK REED'S MODEL 4 UTILITY DISK is fully supported by the author, and it is available now from *Computer News 80* for only $14.95, plus $2.00 for shipping and handling. Order your copy today!



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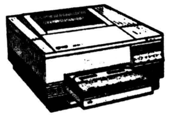

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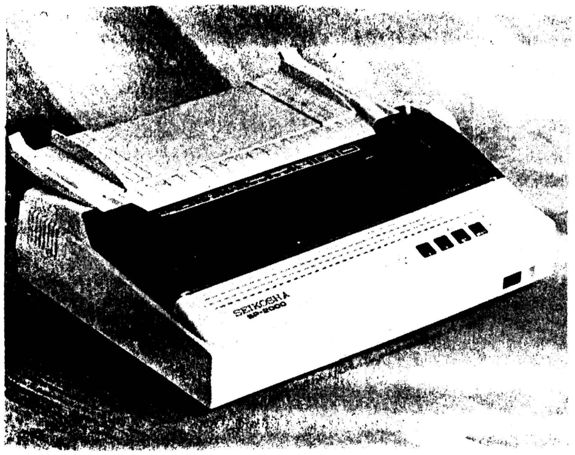

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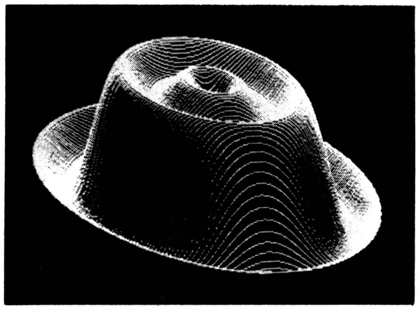

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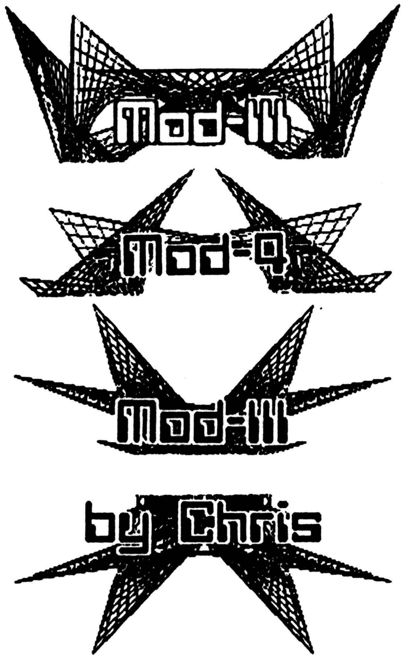

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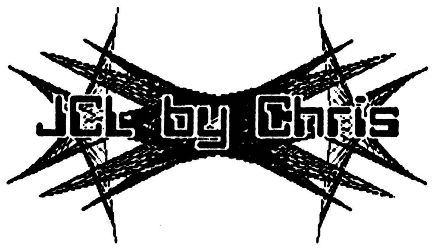

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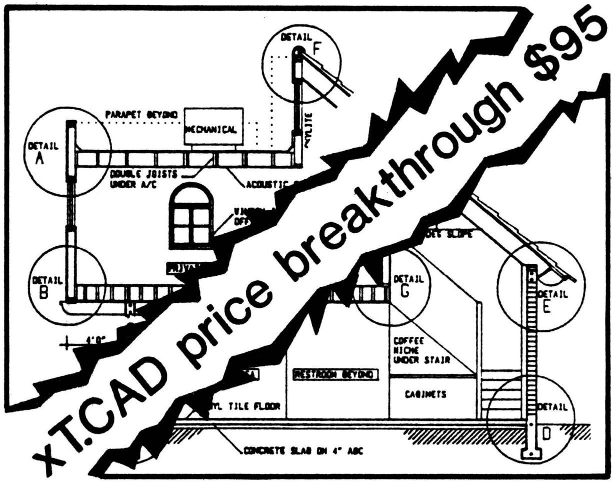

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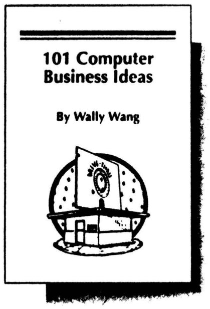
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Wally Wang is the author of numerous books on software and hardware, as well as the Co-Editor of *ComputorEdge*, San Diego's Computer Magazine, where he has a regular column and is a frequent contributor.

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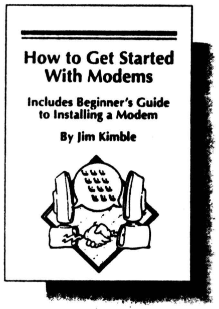
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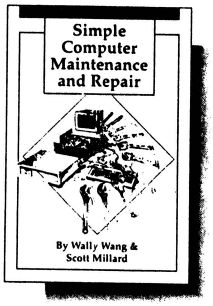
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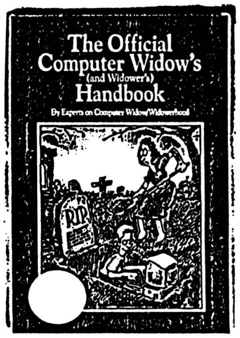
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- ☐ **C016** Utilities: File encode/decode; Memory test; Sort variable length records
- ☐ **C017** Overflow from disk #C016
- ☐ **C018** The Yale catalog of bright stars: Vol. 1 of 8
- ☐ **C019** Overflow from disk #C018
- ☐ **C020** The Yale catalog of bright stars: Vol. 2 of 8
- ☐ **C021** Overflow from disk #C020
- ☐ **C022** The Yale catalog of bright stars: Vol. 3 of 8
- ☐ **C023** Overflow from disk #C022
- ☐ **C024** The Yale catalog of bright stars: Vol. 4 of 8
- ☐ **C025** Overflow from disk #C024
- ☐ **C026** The Yale catalog of bright stars: Vol. 5 of 8
- ☐ **C027** The Yale catalog of bright stars: Vol. 6 of 8
- ☐ **C028** Overflow from disk #C027
- ☐ **C029** The Yale catalog of bright stars: Vol. 7 of 8
- ☐ **C030** Overflow from disk #C029
- ☐ **C031** The Yale catalog of bright stars: Vol. 8 of 8
- ☐ **C032** Overflow from disk #C031
- ☐ **C033** Extensive language analyzer in PL/I with doc & examples
- ☐ **C034** Overflow from disk #C033
- ☐ **C035** Original PDP-11 code for DUNGEON Vol. 1 of 3
- ☐ **C036** Overflow from disk #C035
- ☐ **C037** Original PDP-11 code for DUNGEON Vol. 2 of 3
- ☐ **C038** Overflow from disk #C037
- ☐ **C039** Original PDP-11 code for DUNGEON Vol. 3 of 3
- ☐ **C040** Overflow from disk #C039
- ☐ **C041** Accounts receivable/payable in PL/I and ASM; Database in PL/I
- ☐ **C042** Volume cataloging system
- ☐ **C043** Overflow from disk #C042
- ☐ **C044** SAM76: An interactive text manipulation language
- ☐ **C045** Utilities: File transfer; USER / assist; Remote Bulletion Board System
- ☐ **C046** Overflow from disk #C045
- ☐ **C047** DIMS: Dan's Information Management System database in BASIC
- ☐ **C048** MODEM V7.6, BYE V7.8: Modem programs with source
- ☐ **C049** Overflow from disk #C048
- ☐ **C050** RESOURCE disassembler V7.3; Small FORTH; FINDBAD volume flaw utility
- ☐ **C051** Overflow from disk #C050
- ☐ **C052** Full screen editor in C — originally developed for H19
- ☐ **C053** Overflow from disk #C052
- ☐ **C054** ZCPR V1.6: A Z80 replacement for the CP/M CCP (SQ)
- ☐ **C055** Overflow from disk #C054
- ☐ **C056** Benchmarks in C, Fortran, BASIC; Shell sort; CBASIC2 game
- ☐ **C057** Overflow from disk #C056
- ☐ **C058** A complete database system in PL/I-80
- ☐ **C059** Overflow from disk #C058
- ☐ **C060** In Context Editor in PL/I-80; Typing Tutor in BASIC (both for ADM-31)
- ☐ **C061** Overflow from disk #C060
- ☐ **C062** Remote Bulletin Board System in BASIC and ASM
- ☐ **C063** Overflow from disk #C062
- ☐ **C064** The FED: CBASIC2 program used by Fed Reserve to test money supply policy
- ☐ **C065** Overflow from disk #C064
- ☐ **C066** SYSLIB: A library of over 130 M80 ASM subroutines Vol. 1 of 3
- ☐ **C067** Overflow from disk #C066
- ☐ **C068** SYSLIB: A library of over 130 M80 ASM subroutines Vol. 2 of 3
- ☐ **C069** Overflow from disk #C068
- ☐ **C070** SYSLIB: A library of over 130 M80 ASM subroutines Vol. 3 of 3
- ☐ **C071** Overflow from disk #C070
- ☐ **C072** Disassembler for Z80; Translate Intel 8080 code to Zilog Z80
- ☐ **C073** Overflow from disk #C072
- ☐ **C074** 68000 cross assembler; Tiny ADA compiler written for Polymorphic system
- ☐ **C075** MODEM V7.98: Modem communications program with source
- ☐ **C076** Overflow from disk #C075
- ☐ **C077** ZCPR2: Improved CP/M command processor Vol. 1 of 10
- ☐ **C078** Overflow from disk #C077
- ☐ **C079** ZCPR2: Improved CP/M command processor Vol. 2 of 10
- ☐ **C080** Overflow from disk #C079
- ☐ **C081** ZCPR2: Improved CP/M command processor Vol. 3 of 10
- ☐ **C082** Overflow from disk #C081
- ☐ **C083** ZCPR2: Improved CP/M command processor Vol. 4 of 10
- ☐ **C084** Overflow from disk #C083
- ☐ **C085** ZCPR2: Improved CP/M command processor Vol. 5 of 10
- ☐ **C086** Overflow from disk #C0851
- ☐ **C087** ZCPR2: Improved CP/M command processor Vol. 6 of 10
- ☐ **C088** Overflow from disk #C087
- ☐ **C089** ZCPR2: Improved CP/M command processor Vol. 7 of 10
- ☐ **C090** Overflow from disk #C089
- ☐ **C091** ZCPR2: Improved CP/M command processor Vol. 8 of 10
- ☐ **C092** Overflow from disk #C091
- ☐ **C093** ZCPR2: Improved CP/M command processor Vol. 9 of 10
- ☐ **C094** ZCPR2: Improved CP/M command processor Vol. 10 of 10
- ☐ **C095** ZCPR2 Update disk
- ☐ **C096** Overflow from disk #C095
- ☐ **C097** Simple word processor program in ASM with doc & source
- ☐ **C098** Overflow from disk #C097
- ☐ **C099** A demonstration system for dBASE II
- ☐ **C100** Hard vol. backup programs (may be hardware-specific)
- ☐ **C101** Remote Bulletin Board System in BASIC (SQ)
- ☐ **C102** Overflow from disk #C101
- ☐ **C103** KERMIT: Modem communications for CP/M to mainframe, source in C
- ☐ **C104** Overflow from disk #C103
- ☐ **C105** PISTOL: Portably Implemented Stack Oriented Language similar to FORTH
- ☐ **C106** Overflow from disk #C105
- ☐ **C107** XLISP: An Expirimental LISP compiler in ASM & C
- ☐ **C108** Overflow from disk #C107
- ☐ **C109** LU, LDIR, LRUN: Library filing and utility system for LBR files
- ☐ **C110** Overflow from disk #C109
- ☐ **C111** ZCPR2 Upgrades Vol. 1 of 2
- ☐ **C112** Overflow from disk #C111
- ☐ **C113** ZCPR2 Upgrades Vol. 2 of 2
- ☐ **C114** Overflow from disk #C113
- ☐ **C115** ROFF4 V1.50: A text formatting package in C
- ☐ **C116** Overflow from disk #C115
- ☐ **C117** Utilities: Communications program with XMODEM protocol; DIR sort & pack
- ☐ **C118** Overflow from disk #C117
- ☐ **C119** Mini Bulletin Board System in BASIC (SQ) from Australia
- ☐ **C120** Overflow from disk #C119
- ☐ **C121** A complete order and inventory system in dBASE II (LBR)
- ☐ **C122** Overflow from disk #C121
- ☐ **C123** SIGNON: A system of programs for running an RCP/M bulletin board
- ☐ **C124** Overflow from disk #C123
- ☐ **C125** Software Tools of Australia Vol. 17 - Programs in C, BAS, ASM
- ☐ **C126** Overflow from disk #C125
- ☐ **C127** California Energy Commission Building Energy Design Analysis Vol. 1 of 2
- ☐ **C128** Overflow from disk #C127
- ☐ **C129** California Energy Commission Building Energy Design Analysis Vol. 2 of 2
- ☐ **C130** Overflow from disk #C129
- ☐ **C131** 68000 Cross Assembler from Dr. Dobbs Journal 6800 Cross Assembler
- ☐ **C132** Overflow from disk #C131
- ☐ **C133** BASIC games extracted from Software Tools of Australia
- ☐ **C134** Overflow from disk #C133
- ☐ **C135** Depreciation in BASIC; WordStar indexing program in Pascal
- ☐ **C136** Overflow from disk #C135
- ☐ **C137** Graphing ASM subroutines for MX80; Intel to Zilog source translator
- ☐ **C138** Overflow from disk #C137
- ☐ **C139** Utilities: Text display; Super DIR; VFILER - Screen-oriented file util.
- ☐ **C140** Overflow from disk #C139
- ☐ **C141** CITADEL: A complete bulletin board system in C
- ☐ **C142** Overflow from disk #C141
- ☐ **C143** FORTH-83: Editor, assembler, & documentation
- ☐ **C144** Overflow from disk #C143
- ☐ **C145** Atlanta Database User Group: Member records & banking systems
- ☐ **C146** Overflow from disk #C145
- ☐ **C147** Utilities: Extended ERAse; Cross ref from .PRN files (LBR)
- ☐ **C148** Overflow from disk #C147
- ☐ **C149** Compilers: Concurrent Pascal-S; PL/0 — written in Pascal (not Turbo)
- ☐ **C150** Overflow from disk #C149
- ☐ **C151** CBASIC Users Group: Assorted programs in CBASIC
- ☐ **C152** Overflow from disk #C151
- ☐ **C153** Regular Expression Compiler (REC) in ASM Vol. 1 of 4
- ☐ **C154** Overflow from disk #C153
- ☐ **C155** Regular Expression Compiler (REC) in ASM Vol. 2 of 4
- ☐ **C156** Overflow from disk #C155
- ☐ **C157** Regular Expression Compiler (REC) in ASM Vol. 3 of 4
- ☐ **C158** Overflow from disk #C157
- ☐ **C159** Regular Expression Compiler (REC) in ASM Vol. 4 of 4
- ☐ **C160** Overflow from disk #C159
- ☐ **C161** 8080 to 8086 conversion utilities
- ☐ **C162** Overflow from disk #C161
- ☐ **C163** A/R template for SuperCalc; Bulk ERAse of .BAK, .HEX, etc.
- ☐ **C164** Overflow from disk #C163
- ☐ **C165** Programs for BDS C: Functions in ASM; Bulletin Board; CRT I/O (LBR)
- ☐ **C166** Overflow from disk #C165
- ☐ **C167** C programs: File archiver; Brace matcher; Calls for Aztec C; More (LBR)
- ☐ **C168** Overflow from disk #C167
- ☐ **C169** Utilities: Forth to CP/M screen - file xfer; Synonyms for COM files (LBR)
- ☐ **C170** Overflow from disk #C169
- ☐ **C171** ZCPR3: Z80 replacement for CP/M command processor Vol. 1 of 9
- ☐ **C172** Overflow from disk #C171
- ☐ **C173** ZCPR3: Z80 repl. for CP/M command processor Vol. 2 of 9
- ☐ **C174** Overflow from disk #C173
- ☐ **C175** ZCPR3: Z80 repl. for CP/M command processor Vol. 3 of 9
- ☐ **C176** Overflow from disk #C175
- ☐ **C177** ZCPR3: Z80 repl. for CP/M command processor Vol. 4 of 9
- ☐ **C178** Overflow from disk #C177
- ☐ **C179** ZCPR3: Z80 repl. for CP/M command processor Vol. 5 of 9
- ☐ **C180** Overflow from disk #C179
- ☐ **C181** ZCPR3: Z80 repl. for CP/M command processor Vol. 6 of 9
- ☐ **C182** Overflow from disk #C181
- ☐ **C183** ZCPR3: Z80 repl. for CP/M command processor Vol. 7 of 9
- ☐ **C184** Overflow from disk #C183
- ☐ **C185** ZCPR3: Z80 repl. for CP/M command processor Vol. 8 of 9
- ☐ **C186** Overflow from disk #C185
- ☐ **C187** ZCPR3: Z80 repl. for CP/M command processor Vol. 9 of 9
- ☐ **C188** Utilities: Paged file list; MX80; Passwords; Z80 debugger (LBR)
- ☐ **C189** Overflow from disk #C188
- ☐ **C190** Dot-matrix printer plotting package for C. Itoh, Epson, Okidata
- ☐ **C191** Overflow from disk #C190
- ☐ **C192** Fluff minimax algorithm Dr. Dobbs 7/84; Simplex algorithm Byte 5/84 (LBR)
- ☐ **C193** Overflow from disk #C192
- ☐ **C194** Utilities: LBR extract; SUBMIT replacement; Super DIR; DDT improved
- ☐ **C195** Overflow from disk #C194
- ☐ **C196** Utilities: FIND files; Squeeze/unsqueeze (SQ)
- ☐ **C197** Overflow from disk #C196
- ☐ **C198** A complete property management package using dBASE II Volume 1 of 2
- ☐ **C199** Overflow from disk #C198
- ☐ **C200** A complete property management package using dBASE II Volume 2 of 2
- ☐ **C201** Overflow from disk #C200
- ☐ **C202** Utilities for ZCPR3: DIR sort/pack; Vol. zap; File utility; More (SQ)
- ☐ **C203** Overflow from disk #C202
- ☐ **C204** Source code for ZCPR3 utilities (SQ)
- ☐ **C205** Overflow from disk #C204
- ☐ **C206** ZCPR3 macro library for video screen manipulation; Cryptography (LBR)
- ☐ **C207** Overflow from disk #C206
- ☐ **C208** CP/M-80 to CP/M-86 Xlate; FIND with cross reference capability
- ☐ **C209** Overflow from disk #C208
- ☐ **C210** Forth 83 system with example, documentation, & utilities
- ☐ **C211** Overflow from disk #C210
- ☐ **C212** Utilities: Columnar listings; Sort files; TYPE command improved (LBR)
- ☐ **C213** Overflow from disk #C212
- ☐ **C214** Utilities: ERAse improved; NSWP file handler; improved TYPE (LBR)
- ☐ **C215** Overflow from disk #C214
- ☐ **C216** Regular Expression Compiler with floating point (LBR)
- ☐ **C217** Overflow from disk #C216
- ☐ **C218** Regular Expression Compiler without floating point (LBR)
- ☐ **C219** Overflow from disk #C218
- ☐ **C220** MEX V1.12 modem communications program (SQ)
- ☐ **C221** Overflow from disk #C220
- ☐ **C222** Assorted overlays for use in constructing MEX system (SQ)
- ☐ **C223** Overflow from disk #C222
- ☐ **C224** Assorted overlays for use in constructing MEX system (SQ)
- ☐ **C225** Overflow from disk #C224
- ☐ **C226** Inventory system for dBASE II (LBR)
- ☐ **C227** Overflow from disk #C226
- ☐ **C228** dBASE patches; Area code lookup; 8080 disassembler; DIR repair
- ☐ **C229** Overflow from disk #C228
- ☐ **C230** Ron Cain's Small C compiler complete with floating point math package (LBR)
- ☐ **C231** Overflow from disk #C230
- ☐ **C232** Extra char set for WordStar/FX-80; Scientific font for MX-80
- ☐ **C233** Overflow from disk #C232
- ☐ **C234** dBASE II programs: Checkbook; Church management; Genealogy
- ☐ **C235** Overflow from disk #C234
- ☐ **C236** C programs: File append; Flow listing; Editor; FIND; Split files
- ☐ **C237** Overflow from disk #C236
- ☐ **C238** Databases: Article retrieval; Ref books; Ref material (LBR)
- ☐ **C239** Overflow from disk #C238
- ☐ **C240** Kermit communications V3.9; Updated 8080 to Z80 source translator
- ☐ **C241** Overflow from disk #C240
- ☐ **C242** Utilities: C cross ref; Super DIR V7.7; Print utility in C (LBR)
- ☐ **C243** Overflow from disk #C242
- ☐ **C244** Pilot system in Pascal/Z; Deductive reasoning helps (LBR)
- ☐ **C245** Overflow from disk #C244

☐ **C246** Full screen Z80 debugger. Lots of features, documentation (SQ)
☐ **C247** Overflow from disk #C246
☐ **C248** MEX V1.14: Update to XMODEM & MEX; Turbo Pascal Bulletin Board (LBR)
☐ **C249** Overflow from disk #C248
☐ **C250** Z80 small Prolog with doc; Z80 screen file manager (LBR)
☐ **C251** Package of statistical software: Utilities, game, etc.
☐ **C252** Overflow from disk #C251
☐ **C253** LINPAK single prec. in C, Pascal; Whetstone benchmarks; Turbo LIFE (LBR)
☐ **C254** Overflow from disk #C253
☐ **C255** CNVRT prog. language with example to solve mazes (LBR)
☐ **C256** Overflow from disk #C255
☐ **C257** CNVRT Runtime library, compiler, and help files
☐ **C258** Overflow from disk #C257
☐ **C259** Source programs in ASM for a variety of CP/M functions
☐ **C260** A complete General Ledger system in BASIC
☐ **C261** PILOT language interpreter with ASM source & examples
☐ **C262** Assorted games in Microsoft BASIC and BASIC-E, forerunner of CBASIC
☐ **C263** Z80 assemblers, with source; Simple editor
☐ **C264** Overflow from disk #C263
☐ **C265** Assorted BASIC games: Biorhythm; Chess; Maze; StarTrek; More
☐ **C266** Overflow from disk #C265
☐ **C267** CP/M STOIC: A threaded interpretive language like Forth
☐ **C268** Overflow from disk #C267
☐ **C269** Games in BASIC: Baseball; Civil war; Craps; Swarms; Etc.
☐ **C270** Overflow from disk #C269
☐ **C271** More BASIC games: Drag race; Football; Hangman; Mastermind; More
☐ **C272** Overflow from disk #C271
☐ **C273** Simple database system; ALGOLM compiler, a subset of the ALGOL language
☐ **C274** Search & Rescue programs in BASIC
☐ **C275** Educational programs in CBASIC
☐ **C276** Overflow from disk #C275
☐ **C277** Utilities: Quick SUBMIT; Vol. catalog; File compare; Checksum
☐ **C278** Overflow from disk #C277
☐ **C279** Assorted programs for Ham radio in BASIC
☐ **C280** Overflow from disk #C279
☐ **C281** The Osborne Accounts Receivable & Accounts Payable systems in BASIC
☐ **C282** Overflow from disk #C281
☐ **C283** The Osborne General Ledger system in BASIC
☐ **C284** The Osborne Payroll system in BASIC
☐ **C285** Overflow from disk #C284
☐ **C286** A complete adventure game in BDS C
☐ **C287** Overflow from disk #C286
☐ **C288** Another collection of games in BASIC
☐ **C289** Overflow from disk #C288
☐ **C290** Math package for Microsoft muMATH
☐ **C291** Overflow from disk #C290
☐ **C292** BusinessMaster II accounting package - Vol. 1 of 5 - Documentation
☐ **C293** Overflow from disk #C292
☐ **C294** BusinessMaster II accounting package - Vol. 2 of 5 - Initial, Startup
☐ **C295** Overflow from disk #C294
☐ **C296** BusinessMaster II accounting package - Vol. 3 of 5 - Sample files, Payroll
☐ **C297** Overflow from disk #C296
☐ **C298** BusinessMaster II accounting package - Vol. 4 of 5 - PO/AP, Order entry/AR
☐ **C299** BusinessMaster II accounting package - Vol. 5 of 5 - General ledger
☐ **C300** Utilities: Volume catalog & cross reference; ERAse/UNERAse; Vol. ZAP (SQ)
☐ **C301** Overflow from disk #C300
☐ **C302** More than 50 games in Microsoft BASIC
☐ **C303** Overflow from disk #C302
☐ **C304** Financial planning in CBASIC; AP & AR in CBASIC; Many BASIC games
☐ **C305** Overflow from disk #C304
☐ **C306** Original ADVENTURE and other games in BASIC (SQ)
☐ **C307** BASIC benchmark; Bibliography in BASIC; Many BASIC games
☐ **C308** Cross assemblers for the 6800 and 1802
☐ **C309** Utilities: File archive; Bad sector lockout; Help system; More
☐ **C310** Overflow from disk #C309
☐ **C311** Functions for BDS C: Floating point; Console I/O; Redirected I/O
☐ **C312** Assorted programs, functions for BDS C
☐ **C313** BDS C programs: Higher math functions; File directory; Floating point
☐ **C314** BDS C programs: DIR, Program list; File compression; Word Count program
☐ **C315** Overflow from disk #C314
☐ **C316** BDS C programs: File concatenation; File compare; Text processor
☐ **C317** Overflow from disk #C316
☐ **C318** BDS C programs: Benchmark; Curly brace matcher; Modem program
☐ **C319** Overflow from disk #C318
☐ **C320** BDS C programs: File squeeze/unsqueeze; TYPE for squeezed files
☐ **C321** Overflow from disk #C320
☐ **C322** Software Tools in RATFOR: Complete package in FORTRAN
☐ **C323** BDS C programs: File conversion; Text formatter; Software tools
☐ **C324** A large collection of games in BDS C
☐ **C325** Overflow from disk #C324
☐ **C326** Utilities: Bad sector lockout; Sorted DIR; Z80 disassembler (LBR)
☐ **C327** Utilities: Catalog; Simple vol. ZAP; Editor; File printer; BASIC cross reference
☐ **C328** Games in BASIC: Wizard's Castle; Eliza; Lost Gold; Zodiac (SQ)
☐ **C329** Games in Z80 code, written for Kaypro; Z80 Chess
☐ **C330** Printer art: Assorted pictures to print on your printer (SQ)
☐ **C331** Games and programs in BASIC -- a mixed bag
☐ **C332** BASIC games: DC10; Fireman; Kolossus; Rental property program
☐ **C333** Utilities: Fast SUBMIT; File FIND; File FIX; Password
☐ **C334** MYSTERY -- a large ADVENTURE type game (LBR)
☐ **C335** Utilities: A collection for creation/maintenance of libraries (LBR)
☐ **C336** ALGOLM compiler; FORTH interpreter; Ham programs; Key utility (LBR)
☐ **C337** Printer Spool & Despool (LBR)
☐ **C338** Utilities: Library; Help system; Super DIR; Improved TYPE (LBR)
☐ **C339** Ron Cain's Small C; A collection of WordStar notes & utilitites (LBR)
☐ **C340** Extensive Help system (LBR)
☐ **C341** Games developed for the Kaypro 2 -- some video functions may not work
☐ **C342** Games developed for the Kaypro 2 -- some video functions may not work
☐ **C343** Original ADVENTURE as implemented for the Kaypro 2
☐ **C344** Utilities: Super DIR V8.8; TYPEL V3.1 (LBR)
☐ **C345** Utilities: Lower to upper case; CP/M POWER; Memory to vol. (LBR)
☐ **C346** Z80 assembler system (LBR)
☐ **C347** Utilities: String replacement in file; Turbo Pascal cross reference (LBR)
☐ **C348** Extensive graphic plotting package for Epson MX-80 (LBR)
☐ **C349** WordStar utilities: Footnotes; Document to non-document & back (LBR)
☐ **C350** Another comprehensive Help system (LBR)
☐ **C351** Utilities: MX-80 setup; Gothic letter banner; Word* PS on Prowriter (LBR)
☐ **C352** HANDY V2.0: A collection of desktop tools in CBASIC (LBR)
☐ **C353** Turbo Pascal: Source code from 2 books, Montezuma cursor control (LBR)
☐ **C354** MODEM7 version 4: Program, source code, & utilities

Monte's SELECT Disk #C900: Essential CP/M Utilities

This is a collection of utilities that Monte feels no CP/M user should be without. Each of these programs has been unsqueezed, de-libraried, and installed as needed to be usable on your system immediately. Source code is included when available. Here's what you get:

NSWEEP: Probably the most-used CP/M program ever written, this handy utility will copy, erase, list, squeeze, and unsqueeze files either singly or in groups. You'll need this program for any public domain disk listed in the catalog with (SQ).

UNERA: Have you ever typed "ERA *.BAS" when you meant to say "ERA *.BAK"? For those terrifying moments when programs or data disappear right before your eyes you need UNERAse. This program will resurrect the lost file or files with the same amount of ease that it took to ERAse them in the first place.

FINDBAD: Now you can recycle all those diskettes you were too cheap to throw away. You know, the ones with one or two bad sectors on them. FINDBAD will scan a disk and put all of the bad sectors into a dummy file so that CP/M won't try to use them.

NULU: CP/M isn't all that thrifty with disk space when writing small files. NULU solves that problem by collecting a number of small files into a single library file. Many public domain programs are distributed in libraries. Disks that contain libraries are listed in our public domain catalog with (LBR). You'll need NULU to extract the programs so that they may be used.

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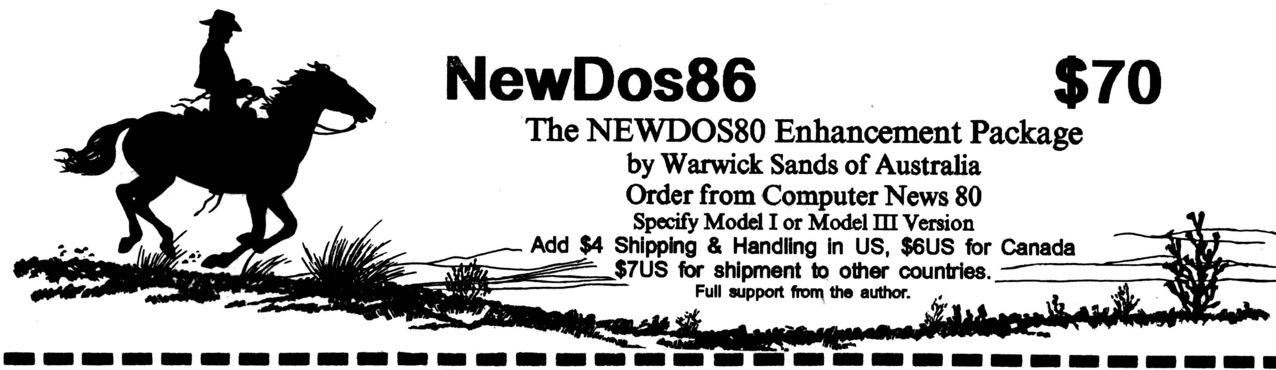

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